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REVISION OF THE AUSTRALIAN NATIVE BEE SUBGENUS *LASIOGLOSSUM (CHILALICTUS)* (HYMENOPTERA: HALICTIDAE)

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Abstract

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The endemic Australian halictid bee subgenus *Lasioglossum (Chilalictus)* is revised and redefined. One hundred and thirty four valid species are recognised. Sixty two new synonymies are proposed: *L. excensum* (Cockerell) = *L. asperithorax* (Cockerell); *L. festivum* (Rayment), *L. haematopum* (Cockerell), *L. sanguinipes* (Cockerell) and *L. leai* (Cockerell) = *L. bicingulatum* (Smith); *L. bassi* (Cockerell) = *L. bligh* (Cockerell); *L. subetheridgei* (Rayment) and *L. eboracense* (Cockerell) = *L. brazieri* (Cockerell); *L. granulithorax* (Cockerell) and *L. idoneum* (Cockerell) = *L. clelandi* (Cockerell); *L. subinclinans* (Cockerell), *L. haematsoma* (Cockerell) and *L. inclinans* (Smith) = *L. cognatum* (Smith); *L. alboguttatum* (Friese) = *L. conspicuum* (Smith); *L. euryurum* (Cockerell), *L. bursariae* (Cockerell) and *L. griscovittatum* (Cockerell) = *L. convexum* (Smith); *L. howeni* (Cockerell) = *L. dischusum* (Cockerell); *L. suberythrurum*, *L. mainusculum* (Rayment), *L. basilucens* (Cockerell), *L. atrocyaneum* (Cockerell), *L. forticorne* (Cockerell), *L. rufotinctum* (Cockerell) and *L. cyclognathum* (Cockerell) = *L. erythrurum* (Cockerell); *L. vividum* (Smith) = *L. florale* (Smith); *L. mulleri* (Rayment), *L. evasum* (Cockerell) and *L. circumdatum* (Cockerell) = *L. gilesi* (Cockerell); *L. confusellum* (Cockerell), *L. isthmale* (Cockerell) and *L. repertum* (Cockerell) = *L. timitans* (Cockerell); *L. mitchelli* (Cockerell) and *Halictus lanuginosus* Smith = *L. lanarium* (Smith); *L. infrahirtum* (Cockerell) = *L. littleri* (Cockerell); *L. spenceri* (Cockerell) = *L. melanopterum* (Cockerell); *L. anexoneuroides* (Rayment), *L. nigropurpeum* (Rayment), *L. luctiferum* (Cockerell), *L. dorsicynaeum* (Cockerell) = *L. mundulum* (Cockerell); *L. furneauxi* (Cockerell) = *L. opacicolle* (Cockerell); *L. viridarii* (Cockerell) = *L. orbatum* (Smith); *L. lanariellum* (Cockerell) and *L. dolichocerum* (Cockerell) = *L. pachycephalum* (Cockerell); *L. mesembryanthemiellum* (Rayment), *L. micridoneum* (Cockerell) and *L. intermedius* (Rayment) = *L. platycephalum* (Rayment); *L. gippsii* (Rayment) and *L. aptum* (Rayment) = *L. repraesentans* (Smith); *L. omnivagum* (Cockerell) = *L. sculpturatum* (Cockerell); *L. nudum* (Rayment) = *L. seductum* (Cockerell); *L. exceptum* (Cockerell) = *L. subplebeium* (Cockerell); *L. goraeense* (Rayment) = *L. tamburinei* (Friese); *L. emeraldense* (Rayment) = *L. victoriellum* (Cockerell); *L. whiteleyi* (Rayment), *L. purpureum* (Rayment), *L. doweri* (Rayment), *L. ornatum* (Rayment), *L. glauerti* (Rayment) and *L. purnongense* (Cockerell) = *L. vitripenne* (Smith); *L. wahlenbergiae* Michener = *L. willsi* (Cockerell). One new combination is proposed: *L. tasmaniae* (Cockerell) = *Homalictus tasmaniae*. Seventy three new species are erected: *L. abrophilum*, *L. adustum*, *L. alacarinatum*, *L. albopilosum*, *L. alpinum*, *L. amboquestrum*, *L. amplexum*, *L. anforticornum*, *L. aquilonium*, *L. argopilatum*, *L. aspratulum*, *L. athrix*, *L. aureopilatum*, *L. bibrochum*, *L. biceps*, *L. bicolor*, *L. bidens*, *L. brochum*, *L. brunnesetum*, *L. bubrachium*, *L. buccalum*, *L. bullatum*, *L. caesium*, *L. cardaleae*, *L. carpobrotum*, *L. castor*, *L. clypeatum*, *L. copleyense*, *L. demicapillum*, *L. ebeneum*, *L. edentulatum*, *L. eremaean*, *L. eremophilum*, *L. eurycephalum*, *L. falcatum*, *L. fasciatum*, *L. frankenia*, *L. froggatti*, *L. grunicalum*, *L. hamatum*, *L. hapsidum*, *L. immaculatum*, *L. inflatum*, *L. lamellosum*, *L. laticlilum*, *L. lineatum*, *L. litovillum*, *L. megacephalum*, *L. mesostenoideum*, *L. metallicum*, *L. mu*, *L. nefrens*, *L. nitens*, *L. occidens*, *L. ochrochilum*, *L. ochroma*, *L. pappodum*, *L. parasphecodum*, *L. pollux*, *L. ptyon*, *L. quadratum*, *L. roddi*, *L. sexsetum*, *L. smaragdinum*, *L. soror*, *L. spatulatum*, *L. speculatum*, *L. striatum*, *L. teltiri*, *L. triangulatum*, *L. tridens*, *L. uncinatum* and *L. xerophilum*.

Keys to both sexes of species and a detailed analysis of the character suite are provided. All species are fully described and illustrated and a map of the known distribution for each is given. Where appropriate, scanning electron micrographs of the female head, labrum and dorsal surface of the mesosoma are provided as well as line drawings of the dorsal, ventral and lateral views of the male genitalia and associated sterna.

Introduction

The Halictidae is one of the largest and most widely distributed families of bees (Krombein et al., 1979). During the past several decades, members of this family have attracted attention due to high diversity of nesting habits and nest architecture (e.g. Sakagami and Michener, 1962), social structure (e.g. Houston, 1970; Knerer, 1980), behaviour (e.g. in Australia: Kukuk and Schwarz, 1987 and 1988; Kukuk and Crozier, 1990) and floral associations (e.g. Bernhardt, 1983, 1984, 1986, 1989; Bernhardt and Walker, 1984, 1985; Bernhardt et al. 1984). Unfortunately, the taxonomy of the family is less studied.

In Australia, the Halictinae is diverse with species richness occurring mainly in the southern two-thirds of the continent. The subfamily is represented by five genera, in descending order of diversity: *Lasioglossum* Curtis, *Homalictus* Cockerell, *Sphecodes* Latreille, *Nomioides* Schenck and *Pachyhalictus* Cockerell (the last two represented by a single species each). *Lasioglossum* is known from all continents and is highly diverse. Michener (1965) divided the Australian species into eight subgenera. Of these, *Australictus* Michener, *Callalictus* Michener, *Glossalictus* Michener and *Pseudochilalictus* Michener are endemic, *Austrevylaeus* Michener extends to New Zealand, *Parasphecodes* Smith occurs in New Guinea and a single species of *Chilalictus* Michener occurs in New Caledonia. The eighth subgenus, *Ctenonomia* Cameron includes extralimital species which occur throughout South-east Asia.

This work revises *Chilalictus*, the largest subgenus. Keys and descriptions, scanning electron micrographs and line drawings, are provided for all species. Biological and medical comments are made were appropriate. In particular, the status of three species, *L. aureopilatum* sp. nov., *L. macrops* (Cockerell) and *L. victoriae* (Cockerell), is of a concern as no specimens have been collected in almost 50 years and these species may now be extinct. Of medical concern is envenomation from *L. lanarium* (Smith) which has placed two victims in hospital with one suffering an anaphylactic reaction.

Materials and Methods

Specimens (24,017) were examined from all Australian museum collections, as well as from the extensive private collection of Mr Norman Rodd of Mt Tomah, New South Wales. Further specimens were received from overseas collections, particularly from the University of Kansas, the California Academy of Science and the Natural History Museum, London; materia from these institutions included many of the types examined. Field work was conducted throughout Queensland, Victoria, the desert areas of central South Australia and the southern areas of Western Australia.

The recommended method of pinning these bees is through the right corner of the scutellum, rather than the mesoscutum, using micropins or minutens. This technique enables maximum access to sculpture characters which are frequently used for identification.

Specimens were examined using a Wild M7 binocular microscope. Examination of slide preparations of various body parts (e.g. labrum, palpi, genitalia) and subsequent drawings of these parts were done using a Wild M20EB compound microscope and a camera lucida. With the aid of a zoom lens on the Wild M20EB, drawings of the genitalia to a similar size were made (dimensions are indicated by scale lines). The genital capsule is a complex structure, made more complicated by ventrally projecting retrorse lobes (figs 31A–D). To display the relevant characters three views, ventral, dorsal and lateral were drawn as well as the seventh and eighth sterna (fig. 31E). The ventral view omits, on the left side the volsella and penis valve, and on the right side, the retrorse lobe. Only the right side of the capsule was drawn to show the dorsal view.

Temporary mounts of male genitalia were prepared by removing the last three or four metasomal segments after 24 hours of rehydration in a humidifier. Best results of tissue maceration were achieved using a 10% KOH solution and boiling in a water bath for 30 minutes, followed with several water washes and dehydration in glacial acetic acid. The metasomal segments were placed into a drop of glycerine and the genitalia dissected out, examined and drawn. Finally, all metasomal tissue was placed in a vial and attached to the pin beneath the specimen.

Specimens or sclerites used for SEMs were washed in a DECON 90 and hot water solution and sonic vibrated for approximately 10 minutes to remove pollen and nectar. The specimens were dried in a Polaron critical point drier, sputter-coated and scanned on a JSM-T20 at 5 kV.

Taxonomic descriptions follow the format employed by recent workers (e.g. Michener,

1980; McGinley, 1986; Walker, 1986). Character states common to all members of the subgenus are omitted from species descriptions. A full citation list for each species is available in Cardale (1993); only original descriptions and synonymies are cited here. The condition of types should be considered good unless otherwise indicated. All available type material was examined, listed, and distributions, including latitudes and longitudes, are given. Absolute body and relative head measurements for all type specimens are presented in Appendix 1. The designation of paratypes for new species known from hundreds of specimens was usually restricted to specimens taken with the holotype or in the surrounding areas at, or about, the same time as the holotype. The full label data, including latitudes and longitudes, are given for all type material. Abbreviated label data are provided for the remaining specimens, although full label data for these specimens are available in Walker (1994). The floral forage record lists the plant families and genera on which each species was collected and does not assume that pollen, nectar or oils were gathered; therefore such records should be used only as a guide to the pollination potential of a species. Each plant family and genus floral forage record provides the number of catches, not specimens, of that species on that plant. The frequency of capture of a species on a particular plant family or genus is a better indication of its forage preferences than the number of specimens caught as the latter is too variable. The flight phenology data for each species, record the number of collections made of the species, not the number of specimens collected. The computer program MAPPLOT (O'Neill and Yeates, 1987) was used to generate a Mercator distribution map for each species.

The terminology of morphological features follows Michener (1965, 1978), except as follows:

Body length. To reduce the imprecision of this measurement, the total body length was usually measured only on uncurled specimens; separate measurements of head, mesosoma and metasoma were tallied for curled specimens. Head flexure may result in body length measurement variation. The position of the antennal sockets is minimally affected by head flexure, therefore this point was used in all body measurements rather than the anterior margin of the clypeus.

Relative head measurements. Figures 3A and 3B detail the points used for relative head measurements. Abbreviations used are listed below. To ensure relative head measurements were easily comparable between sexes, and particularly between species, the method adopted by Houston (1983, 1990, 1991) was used. All relative head measurements were standardised to a head width of 100 units. They may then be expressed as a percentage and are directly comparable between sexes and species.

Labrum. The *L. (Chilalictus)* female labrum is a complex structure offering a suite of characters for diagnostic analysis. The labrum is dorsoventrally compressed (fig. 8C) and should be viewed dorsally, as lateral (fig. 8D) and ventral views are non-informative in terms of morphological characters. For convenience of character analysis, the labrum was treated as two separate processes, a basal box and a distal process (fig. 8C). The basal box is rectangular and may possess median protuberances, lateral depressions or a raised anterior margin. The distal process may have one of three shapes: triangular with the lateral margins tapering to a rounded point; with the lateral margins slightly tapering and the distal margin broadly truncate or sinuate; or with the lateral margins slightly flanged so that the distal margin is wider than the basal margin. The distal margin in several species is deeply emarginate. A median keel is always present, though reduced in several species. Lateral ridges are either absent or present, and if present are either small or grossly enlarged and serrate dorsally. Lateral teeth are either present or absent, if present they are either straight or distally hooked. Lateral setae are always present, the point of insertion being either on the margin or in from the margin at a distance less than the diameter of the seta or in from the margin as a distance greater than the diameter of the seta.

Wing length. Fraying of distal portions of the wings reduces the precision of measurements of wing length. Therefore, following McGinley (1986), forewing length was measured from the base of the arcuate basal vein (vein M) to the distal most margin of the third submarginal cell (vein 2 r-m) (fig. 3D).

Pronotal lateral angle. This angle was assessed in dorsal view, being rounded, bluntly obtuse or acute. The lateral angle was usually projected although in several species it is absent.

Ratios. Several ratios were calculated relative to the head: antennae, mesoscutum, scutellum and propodeum. All measurements were made at the widest point.

Sculpture nomenclature. This follows Harris (1979).

Mesoscutum punctation nomenclature. This follows Walker (1986): dense, interspaces

between punctures less than diameter of a puncture; close, interspaces between punctures equal to diameter of puncture; open, interspaces between punctures greater than 1 × but less than 2 × diameter of puncture; sparse, interspaces between punctures equal to or greater than 2 × diameter of puncture. To standardise the description of the mesoscutum punctation, the mesoscutum was subdivided into areas as follows (see fig. 3C): anteromesial, area along the leading edge of the mesoscutum and on each side of the midline; anterolateral, area on the anterior lateral corners of the mesoscutum; mesial, area between parapsidal lines; parapsidal areas, areas between parapsidal lines and nearest lateral margin; laterad of parapsidal lines, area adjacent to the outer margin of the parapsidal lines; mesiad of parapsidal lines, area adjacent to the inner margin of the parapsidal lines; posterior, area along the posterior margin of the mesoscutum.

Tibial spurs. Analysis of the tibial spurs as presented by Eickwort and Fischer (1963) was not attempted. Gross shapes are recorded for each species.

Retrorse lobes (fig. 31D). The male genitalia of *L. (Chilalictus)* species often possess large lobes arising from the lateral ventral surface of the gonocoxite. These lobes are referred to as retrorse lobes following the terminology of Mitchell (1960), Michener (1978) and McGinley (1986). The retrorse lobes consists of a ventral lobe that projects at almost 90° to the ventral surface of the gonocoxite. In several species, the ventral lobe possesses an additional process that arises along the margin of the ventral lobe and is parallel to the ventral surface of the gonocoxite. I have named this additional lobe the "ventral flange". Vestiture of the retrorse lobes occurs only on the inner margin and varies from glabrous to coarsely setose. When the genital capsule is viewed ventrally it appears that the setae occur on the outer surface of the lobes. The lateral view clearly shows that the setae arise from the inner surface only.

Institutions and Depositories

The following abbreviations are used for museums and other institutions holding specimens examined during this study: AM, Australian Museum, Sydney, New South Wales; AMNH, American Museum of Natural History, New York; ANIC, Australian National Insect Collection, CSIRO, Canberra, Australian Capital Territory; BCRI, Biological and Chemical Research Institute, Sydney, New South Wales; BERLIN, Institut für Spezielle Zoologie und Zoologisches Museum der Humboldt Universität, Berlin; BISHOP, Bernice P. Bishop Museum, Honolulu, Hawaii; BMNH, Natural History Museum, London; CAS, California Academy of Sciences, San Francisco, California; DPI, Department of Primary Industries Insect Collection, Brisbane, Queensland; DPIM, Department of Primary Industries Insect Collection, Mareeba, Queensland; LACM, Los Angeles County Natural History Museum, California; MUBD, University of Melbourne, School of Botany, Melbourne, Victoria; NMV, Museum of Victoria, Melbourne, Victoria; QM, Queensland Museum, Brisbane, Queensland; RODD private collection of Mr Norman Rodd, Mt Tomah, New South Wales (The final deposition of this collection will be AM); SAM, South Australian Museum, Adelaide, South Australia; SEM, Snow Entomological Museum, University of Kansas, Lawrence, Kansas; TDA, Tasmanian Department of Agriculture, Hobart, Tasmania; UQIC, University of Queensland Insect Collection, Brisbane, Queensland; USNM, United States National Museum, Smithsonian Institution, Washington; WADA, Western Australia Department of Agriculture Insect Collection, Perth, Western Australia; WAITE, Waite Agricultural Research Institute, University of Adelaide, Adelaide, South Australia; WAM, Western Australian Museum, Perth, Western Australia.

Descriptive abbreviations are as follows (figs 3A–D, 31A–E): AOD, antennocular distance; AS, antennal segment; BP, hind basitibial plate; CL, clypeal length; EW, eye width, in side view; FL, flagellum length; GL, glossa length; GW, genal width, in side view; HL, head length; HW, head width; IAD, interantennal distance; IOD, interocellar distance; LID, lower interorbital distance; LPL, labial palpus length; MGL, maxillary galeal length; MPL, maxillary palpus length; ML, mandibular length; MS, malar space; MW, basal width of mandible; OAD, ocellantennal distance; OOD, ocellocular distance; PGL, paraglossa length; PML, prementum length; SCL, supraclypeal length measured from ventral margin of antennal sockets to epistomal suture; SD, standard deviation; S1–S8, metasomal sterna 1–8; SL, scape length; T1–T5, metasomal terga 1–5; UID, upper interorbital distance. Collector name abbreviations are as follows: JCC, J. C. Cardale; EME, E. M. Exley; TFH, T. F. Houston; IDN, I. D. Naumann; KLW, K. L. Walker.

Checklist

Lasioglossum (Chilalictus) is endemic to Australia with the exception of *L. (C.) polygoni* (Cockerell). The type locality of this species is New Caledonia, although presumed conspecific specimens have been recorded from north Queensland (see *Remarks* on *L. polygoni*). Unfortunately no males were available for study from either locality nor was there any recent additional material from New Caledonia.

Michener (1965) erected *L. (Chilalictus)* and associated with it 130 specific names. These species were new combinations from *Halictus* Latreille, except for several new species which he placed directly into the subgenus. In addition, Walker (1986) transferred two *Homalictus* species to *L. (Chilalictus)*.

A complete checklist giving the current status of all species names referred to *L. (Chilalictus)* is presented in Table 1. The number of specimens of both sexes examined for each valid species is provided as a guide to the abundance of the species.

The checklist is summarised as follows. Currently, there are 134 valid species recognised under *L. (Chilalictus)*, although the subgeneric placement of two valid taxa (*L. bligli* (Cockerell) and *L. disclusum* (Cockerell)) cannot be resolved until females are collected. The 134 valid taxa comprise 73 new species, 59 valid species from Michener's 1965 checklist and two from Walker (1986). The status of the remaining 71 names from Michener's 1965 checklist is as follows: 65 synonymised, 62 as new synonymies and three previously nominated (and accepted here) by Cockerell; four species with status unresolved where type material or associated specimens remain unknown (*L. darwiniellum* (Cockerell), *L. familiare* (Erichson), *L. infimum* (Erichson) and *L. percingulatum* (Rayment); one *nomen nudum* (*L. dimorphum* (Rayment)); and one new combination (*Homalictus tasmaniae* (Cockerell) comb. nov.).

Table 1. Checklist of Australian *Lasioglossum* (*Chilalictus*) spp. and number of specimens examined.

Species	No. of specimens:		
	♀	♂	Total
L. abrophilum sp. nov.	1	7	8
L. adustum sp. nov.	100	41	141
L. alacarinatum sp. nov.	46	3	49
L. albopilosum sp. nov.	16	15	31
L. alpinum sp. nov.	0	3	3
L. amboquestrum sp. nov.	9	0	9
L. amplexum sp. nov.	199	207	406
L. anforticornum sp. nov.	6	4	10
L. appositum (Rayment)	2594	80	2674
L. aquilonium sp. nov.	3	0	3
L. argopilatum sp. nov.	2	3	5
L. asperithorax (Cockerell)	34	29	63
L. excusum (Cockerell) syn. nov.			
L. aspratulum sp. nov.	83	22	105
L. athrix sp. nov.	9	5	14
L. aureopilatum sp. nov.	6	2	8
L. baudini (Cockerell)	30	20	50
L. bibrochum sp. nov.	2	1	3
L. biceps sp. nov.	11	8	19
L. bicingulatum (Smith)	543	304	847
L. leai (Cockerell) syn. nov.			
L. sanguinipes (Cockerell) syn. nov.			
L. haematopum (Cockerell) syn. nov.			
L. festivum (Rayment) syn. nov.			

Table 1. Checklist of Australian *Lasioglossum* (*Chilalictus*) spp. (continued)

Species	No. of specimens:		
	♀	♂	Total
L. bicolor sp. nov.	43	3	46
L. bidens sp. nov.	15	3	18
L. blighi (Cockerell)	0	3	3
L. bassi (Cockerell) syn. nov.			
L. brazieri (Cockerell)	71	63	134
L. eboracense (Cockerell) syn. nov.			
L. subetheridgei (Rayment) syn. nov.			
L. brochum sp. nov.	16	0	16
L. brunnesetum sp. nov.	100	63	163
L. bubrachium sp. nov.	2	56	58
L. bucculum sp. nov.	21	28	49
L. bullatum sp. nov.	0	6	6
L. caesium sp. nov.	7	0	7
L. calophyllae (Rayment)	123	13	136
L. cambagei (Cockerell)	9	9	18
L. cardaleae sp. nov.	0	5	5
L. carpobrotum sp. nov.	2	1	3
L. castor sp. nov.	163	22	186
L. cephalochilum Michener	23	4	27
L. chapmani (Cockerell)	276	93	369
L. clariventre (Friese)	36	1	37
L. clelandi (Cockerell)	222	140	362
L. idoneum (Cockerell) syn. nov.			
L. granulithorax (Cockerell) syn. nov.			
L. clypeatum sp. nov.	17	22	39
L. cognatum (Smith)	763	357	1120
L. inclinans (Smith) syn. nov.			
L. haematsoma (Cockerell) syn. nov.			
L. subinclinans (Cockerell) syn. nov.			
L. colonicum (Rayment)	8	0	8
L. conspicuum (Smith)	93	11	104
L. alboguttatum (Friese) syn. nov.			
L. convexum (Smith)	94	50	144
L. griseovittatum (Cockerell) syn. nov.			
L. bursariae (Cockerell) syn. nov.			
L. mjobergi (Friese) syn. by Cockerell.			
L. euryurum (Cockerell) syn. nov.			
L. copleyense sp. nov.	2	1	3
L. demicapillum sp. nov.	11	4	15
L. disclusum (Cockerell)	0	23	23
L. boweni (Cockerell) syn. nov.			
L. ebeneum sp. nov.	73	72	145
L. edentulatum sp. nov.	3	0	3
L. eremaean sp. nov.	502	312	814
L. eremophilum sp. nov.	3	0	3
L. erythrurum (Cockerell)	1130	41	1171
L. cyclognathum (Cockerell) syn. nov.			
L. rufotinctum (Cockerell) syn. nov.			
L. forticorne (Cockerell) syn. nov.			
L. atrocyaneum (Cockerell) syn. nov.			
L. basilucens (Cockerell) syn. nov.			
L. maiusculum (Rayment) syn. nov.			
L. suberythrurum (Rayment) syn. nov.			

Species	No. of specimens:		
	♀	♂	Total
L. eurycephalum sp. nov.	47	14	61
L. expansifrons (Cockerell)	97	64	161
L. falcatum sp. nov.	8	0	8
L. fasciatum sp. nov.	324	213	537
L. florale (Smith)	1202	796	1998
L. vividum (Smith) syn. nov.			
L. frankenia sp. nov.	38	3	41
L. froggatti sp. nov.	0	1	1
L. gilesi (Cockerell)	320	73	393
L. circumdatum (Cockerell) syn. nov.			
L. evasum (Cockerell) syn. nov.			
L. milleri (Rayment) syn. nov.			
L. globosum (Smith)	45	20	65
L. greavesi (Rayment)	155	80	235
L. grumiculum sp. nov.	0	6	6
L. gunbowerense (Rayment)	226	32	258
L. gynochilum Michener	60	85	145
L. hamatum sp. nov.	0	2	2
L. hapsidum sp. nov.	33	1	34
L. helichrysi (Cockerell)	169	74	243
L. hemichalceum (Cockerell)	406	64	470
L. humei (Cockerell)	63	13	76
L. imitans (Cockerell)	53	31	84
L. repertum (Cockerell) syn. nov.			
L. isthmale (Cockerell) syn. nov.			
L. confusellum (Cockerell) syn. nov.			
L. immaculatum sp. nov.	222	180	402
L. inflatum sp. nov.	9	8	17
L. instabilis (Cockerell)	268	30	298
L. elliotii (Rayment) syn. nov.			
L. lamellosum sp. nov.	5	17	22
L. lanarium (Smith)	363	714	1077
Halictus lanuginosus Smith syn. nov.			
L. mitchelli (Cockerell) syn. nov.			
L. latichilum sp. nov.	6	0	6
L. lineatum sp. nov.	2	0	2
L. litovillum sp. nov.	35	8	43
L. littleri (Cockerell)	112	11	123
L. infrahirtus (Cockerell) syn. nov.			
Halictus obscuripes (Friese) syn. by Cockerell.			
L. macrops (Cockerell)	2	6	8
L. mediopolitum (Cockerell)	430	20	450
L. megacephalum sp. nov.	32	26	58
L. melanopterum (Cockerell)	7	4	11
L. spenceri (Cockerell) syn. nov.			
L. mesembryanthemi (Cockerell)	49	16	65
L. mesostenoideum sp. nov.	51	53	104
L. metallicum sp. nov.	8	1	9
L. mirandum (Cockerell)	241	36	277
L. moreense (Cockerell)	39	9	48
L. mu sp. nov.	79	8	87

Table 1. Checklist of Australian *Lasioglossum* (*Chilalictus*) spp. (continued)

Species	No. of specimens:		
	♀	♂	Total
L. mundulum (Cockerell)	435	70	505
L. dorsicynaeum (Cockerell) syn. nov.			
L. luctificum (Cockerell) syn. nov.			
L. nigropurpureum (Rayment) syn. nov.			
L. anexoneuroides (Rayment) syn. nov.			
L. nefrens sp. nov.	3	6	9
L. nigropolitum (Cockerell)	16	0	16
L. nitens sp. nov.	21	0	21
L. oblitum (Smith)	25	0	25
L. obscurissimum Michener	328	129	457
L. occidens sp. nov.	35	2	37
L. ochrochilum sp. nov.	23	5	28
L. ochroma sp. nov.	54	34	88
L. opacicolle (Cockerell)	109	18	127
L. furneauxi (Cockerell) syn. nov.			
L. orbatum (Smith)	288	192	480
L. viridarii (Cockerell) syn. nov.			
L. pachycephalum (Cockerell)	40	70	110
L. dolichocerum (Cockerell) syn. nov.			
L. lanariellum (Cockerell) syn. nov.			
L. pappodum sp. nov.	0	5	5
L. parasphecodum sp. nov.	21	12	32
L. platycephalum (Rayment)	46	19	65
L. intermedius (Rayment) syn. nov.			
L. micridoneum (Cockerell) syn. nov.			
L. mesembryanthemiellum (Rayment) syn. nov.			
L. plebeium (Cockerell)	67	16	83
L. pollux sp. nov.	1	2	3
L. polygoni (Cockerell)	15	0	15
L. ptyon sp. nov.	2	0	2
L. pulvitectum (Cockerell)	121	54	175
L. quadratum sp. nov.	31	32	63
L. repraesentans (Smith)	86	12	98
L. aptum (Rayment) syn. nov.			
L. gippsii (Rayment) syn. nov.			
L. roddi sp. nov.	1	1	2
L. sculpturatum (Cockerell)	132	18	150
L. omnivagum (Cockerell) syn. nov.			
L. seductum (Cockerell)	71	40	111
L. mudum (Rayment) syn. nov.			
L. seminitens (Cockerell)	41	5	46
L. sexsetum sp. nov.	64	43	107
L. smaragdinum sp. nov.	10	3	13
L. soror sp. nov.	293	451	744
L. spatulatum sp. nov.	2	0	2
L. speculatum sp. nov.	52	19	71
L. striatum sp. nov.	35	2	37
L. subplebeium (Cockerell)	116	9	125
L. exceptum (Cockerell) syn. nov.			
L. supralucens (Cockerell)	161	9	170
L. tamburinei (Fricse)	73	10	83
L. goraeense (Rayment) syn. nov.			

Species	No. of specimens:		
	♀	♂	Total
L. teltiri sp. nov.	16	3	19
L. triangulatum sp. nov.	391	180	571
L. tridens sp. nov.	19	2	21
L. uncinatum sp. nov.	0	1	1
L. veronicae (Cockerell)	203	152	355
L. victoriae (Cockerell)	7	7	14
L. victoriellum (Cockerell)	237	23	260
L. emeraldense (Rayment) syn. nov.			
L. vitripenne (Smith)	513	361	874
L. purnongense (Cockerell) syn. nov.			
L. mackayense (Friese) syn. by Cockerell.			
L. glauerti (Rayment) syn. nov.			
L. ornatum (Rayment) syn. nov.			
L. doweri (Rayment) syn. nov.			
L. purpureum (Rayment) syn. nov.			
L. whiteleyi (Rayment) syn. nov.			
L. willsi (Cockerell)	109	64	173
L. wahlenbergiae Michener syn. nov.			
L. xerophilum sp. nov.	16	0	16
Totals	17057	6960	24017

Morphological Analysis

Measurements

Absolute measurements. Known body lengths of *L. (Chilalictus)* species range from small (♀ 3.23 mm, ♂ 2.93 mm, for *L. smaragdinum*) to large (♀ 12.32 mm, ♂ 10.78 mm, for *L. tamburinei*). This is the largest range for Australian Halictinae. The body lengths of several *L. (Parasphecodes)* species are similar to the largest of the range, while several *L. (Austrevylaeus)* species are similar to the smallest.

Species with metallic markings are usually smaller (♀ 3.23–6.31 mm, $\bar{x}$=4.64 mm; ♂ 2.93–5.08 mm, $\bar{x}$=3.99) than species with dark, non-metallic markings (♀ 3.93–12.32 mm, $\bar{x}$=6.92 mm; ♂ 3.39–10.78 mm, $\bar{x}$=5.83). The metallic species occur predominantly in the hot and dry climate of the Eyrean province while non-metallic species occur mainly in the cool and wet climate of the Bassian region. In general, *L. (Chilalictus)* species are smaller in hot, dry climates than those species restricted to a cooler Bassian climate. (Biogeographic provinces according to Main (1981). This might suggest that metallic colour is advantageous in hot environs because it minimises solar heating but the distributions of metallic and non-metallic species-groups overlap.

Most females in the metallic species-group have bright metallic markings on all dorsal surfaces of the body but *L. erythrurum*, *L. hemichalceum* and *L. mundulum*, which occur throughout the Eyrean and Bassian provinces, have relatively dull metallic markings compared to those limited to the Eyrean province. Females in the non-metallic species-group occurring in the Eyrean province, either exhibit bright metallic markings on the head and mesosoma (*L. eremaean* and *L. metallicum*) or have a black head and mesosoma and highly polished and reflective mesoscutum (*L. ebeneum* and *L. eurycephalum*).

Relative measurements. Both sexes have similar ranges of relative head measurements except in some species where the upper range of the flagellum length of the male is greater than in the female (Table 2). Most relative measurement characters proved useful for species determination but few were useful for discriminating species-groups.

Table 2. Relative head measurements of female (123 spp., n=1218 specimens) and male (118 spp., n=864 specimens) *Lasioglossum* (*Chilalictus*) spp.

	Ranges	Mean	Standard deviation
Female			
HL	72–118	83.50	6.00
UID	53–73	61.15	3.62
LID	43–65	55.85	3.10
AOD	18–23	20.39	1.23
IAD	8–19	11.44	1.90
OAD	20–43	28.11	4.42
IOD	14–28	19.80	3.21
OOD	10–30	15.71	2.86
CL	16–26	20.46	1.61
GW	13–28	17.99	2.46
EW	19–32	25.12	2.17
SL	28–47	38.59	3.32
FL	55–84	69.79	6.81
Male			
HL	70–118	85.90	5.31
UID	52–72	63.99	3.18
LID	40–70	49.95	4.62
AOD	12–21	16.99	1.70
IAD	10–19	14.44	1.68
OAD	22–39	27.50	3.42
IOD	16–28	21.31	3.04
OOD	12–25	17.50	2.60
CL	15–26	20.83	1.78
GW	14–40	18.03	2.74
EW	24–37	29.68	2.39
SL	20–37	29.18	3.04
FL	55–205	120.26	28.74

Morphological and biological character suites of *L. (Chilalictus)* suggest that there are two major species-groups: the metallic (group 1) and non-metallic. Within the latter are two smaller species-groups, based on the absence (group 2) or presence (group 3) of posterolateral carinae on the dorsal surface of the propodeum carinae. A discriminant analysis on relative head measurements of these groups was used to test whether they could be used to separate taxa into their respective species-groups and which characters would determine such groupings.

The results are expressed as factor plot diagrams and tabulated correlation values for relative head measurements (fig. 2). In both sexes, the metallic species-group is well distinguished with over 90% separation from the other two groups, whereas the two non-metallic groups remain merged and show less than 10% overlay on the metallic species-group. The correlation coefficients (Table 3) indicate that for the female, frons length (OAD), head length (HL) and upper interorbital distance (UID) are most useful characters in descending order. For the male, the useful characters are interocellar distance (IOD) and frons length (OAD), in that order, although both have lower correlation coefficients than those scored for the female.

These results give morphological support to the two major species-groups but not to the subgroups of the non-metallic species-group. Several desert-inhabiting, non-metallic species have head elongation (OAD) similar to species of the metallic group.

OAD (a measure of frons length) is useful to separate females of the metallic and non-metallic species-groups; in males, OAD is not so useful for species-group separation. In general, the *Lasioglossum (Chilalictus)* species from the Eyrean province, mainly of the metallic species-group, have OAD equal to or greater than 30%, with one species (*L. frankenia*) at 43%. Most species from the Bassian province, mainly of the non-metallic species-group, have OAD values less than 30% although there are several exceptions. This difference can be explained in terms of feeding strategies. Metallic species mainly occur in the semi-arid and arid Eyrean province whereas the black, non-metallic species occur in a cooler, wetter climate of the Bassian province. Plants in the Eyrean province often possess a range of xeric features designed to reduce water loss, in particular elongation of the corolla (e.g. *Eremophila* R.Br., a commonly used nectar source). To best utilise available nectar resources from nectaries located in an elongated corolla, many Eyrean species of *L. (Chilalictus)* have an increased head length compared to species found in the Bassian province.

While the metallic species-group dominates the drier areas, several species occur across the lower Eyrean region and intrude extensively into the Bassian region. One, *L. vitripenne*, is the only metallic species with OAD equal to or less than 30% (OAD, 28–30). Conversely, several of the desert-inhabiting, non-metallic species (e.g. *L. biceps* (OAD, 36–37) and *L. inflatum* (OAD, 34–35)) have OAD values greater than 30%. These results suggest a strong correlation between frons length and habitat. Other relative head measurements are not correlated with colour or habitat in this way.

Table 3. Discriminant analysis, using relative head measurements (RHM), correlations between conditional dependent variables and dependent canonical factors for female and male *Lasioglossum* (*Chilalictus*) spp.

	Female		Male	
Factor RHM	1	2	1	2
HL	−0.174	−0.189	−0.031	−0.385
UID	+0.044	−0.649	+0.016	+0.303
LID	−0.348	+0.092	+0.385	+0.267
AOD	+0.165	−0.077	−0.140	+0.243
IAD	−0.120	−0.107	+0.219	+0.250
OAD	−0.654	−0.446	+0.490	+0.053
IOD	−0.603	−0.409	+0.556	−0.213
OOD	+0.329	−0.462	−0.289	+0.405
CL	+0.194	−0.043	−0.232	−0.092
GW	−0.113	+0.450	+0.099	−0.302
EW	−0.295	−0.098	+0.316	+0.092
SL	+0.268	+0.337	−0.157	+0.400
FL	−0.063	+0.497	−0.059	−0.356

The ratio UID:LID is an indicator of head shape. In both sexes, the frontal view of the head is generally triangular (figs 3A, 4B). The lower margins of the inner orbits converge strongly in the male, except in *L. megacephalum* where they diverge. The head of the female varies more: (1) short and broad (e.g. *L. eurycephalum* fig. 4C); (2) square, UID=LID (e.g. *L. smaragdinum* cf. fig. 4E); (3) wider at the base, UID<LID (e.g. *L. anforticornum* fig. 4A). Head length is generally less than head width with two exceptions. *Lasioglossum eremophilum* has a head length equal to the head width and *L. frankenia* has a head length 1.2 times the head width. Both appear to be obligate feeders on the tubular flowers of *Eremophila* and *Frankenia* L., respectively, and the head shape permits them to exploit these flowers. The gross elongation of *L. frankenia* results from lengthening of the frons and supraclypeal area and a wide malar space is present in both sexes. The possession of a malar space is unique to *L. frankenia*.

The ratio of AOD (position of the antennal bases relative to the inner margin of the orbits) to IAD (width between the antennal bases) is approximately 1.7 in both sexes of all species. *Lasioglossum megacephalum* is the only exception in which both distances are equal.

The value of IOD (distance between inner margins of lateral ocelli) in most species is greater than the value of OOD (distance between outer margin of a lateral ocellus and nearest inner eye margin). Rare exceptions do occur such as equal distances for both values or OOD greater than IOD.

The values of CL are not informative in either sex for clustering species-groups nor for species determination. Values for both sexes were similar (18–22%) across all species. The relatively constant value of CL indicates that an increase in head length is usually achieved through elongation of the frons (OAD), except in *L. frankenia* as noted above.

The values of GW and EW for the female are also not informative, varying little between species. Values for males are an expression of macrocephaly, a common occurrence in the metallic species-group. To further demonstrate this macrocephaly, mandibular length (ML) is recorded for the male only. Head enlargement is restricted to the females of three species and its form varies. In the females of *L. bucculum* and *L. megacephalum* macrocephaly involves a general increase of the entire head, best seen in side view showing the genae enlarged and broadly rounded. Males of these species are also macrocephalic. Macrocephaly in the females of *L. anforticornum* consists of a large, narrow spine-like process on each gena; males are not macrocephalic.

The males of 32 species (23.8%) (18 species (13.4%) metallic, 14 species (10.4%) non-metallic) exhibit macrocephaly. In general, metallic species have a higher proportion of macroce-

phalic males than do non-metallic species. Of almost 800 males of *L. florale*, few do not display some form of head development.

The presence of intermediates between morph variants is important when categorising macrocephaly. (Care should be taken when assessing available intermediates. Fewer macrocephalic specimens of non-metallic species were available for study, therefore intermediates between extreme macrocephalic conditions were often absent, whereas a greater number of macrocephalic specimens were available for metallic species and these usually demonstrated a full range of intermediate morphs.) Two types of macrocephaly are recognised: Type A males are fully winged and have intermediates between morph extremes while Type B males have reduced wing development and do not have intermediates between morph extremes. At present, only *L. hemichalceum* is recognised as an example of Type B (Houston, 1970; Kukuk and Schwarz, 1988; mis-identified as *L. erythrurum*). However, a single specimen of a new species, *L. quadratum*, appears to have many of the morphological characteristics of Type B males (including enlargement of the clypeus, genae, vertex and the entire body proportions with a reduction in the antennae size, and no known intermediates between extremes of the morphs in this species) but the specimen is fully and functionally winged. Further studies into macrocephaly within this subgenus are warranted. Table 4 provides a checklist of *L. (Chilalictus)* species that exhibit macrocephaly.

The female values of SL are useful for species determination only. The length of the scape in relation to the position of the anterior margin of the median ocellus (reaching or not reaching), does not cluster into species-groups. The scape of the male is short and never extends to the level of the anterior margin of the median ocellus.

The length of the flagellar segments is not informative in the female but highly informative in the male (Table 2). In the female, flagella are short (i.e. never greater than HW) and relatively constant across all species (range 55–84, SD=6.81, n=1218). Males show greater variation (range 55–204, SD= 28.74, n= 864). The ratio FL:UID clustered species into three groups: group A, <1.50; group B, 1.50–2.70; group C, >2.70. Group A contains 26, small metallic and non-metallic, species, group C has five, large non-metallic, species and group B has the remaining 87 species.

Comparison of AS2+3 (i.e. the length of antennal segment 2 (pedicle) plus antennal segment 3 (flagellar segment 1)) to AS4 (the length of flagellum segment 2) (figs 20A–C), clustered species into three groups: (1) AS2+3<AS4, (2) AS2+3=AS4 and (3) AS2+3>AS4. This grouping is similar to the FL:UID groupings and most species are in group (2). Differences in the male antennal ratios are used for generic separation of males of New World species of *Lasioglossum* and *Evylaeus* Robertson (McGinley, 1986), but the full range of the ratios used for such generic separation are represented within species of *L. (Chilalictus)*.

Head

Frons shape. The frons, in side view, is slightly convex except in *L. aquilonium*, *L. bicingulatum*, *L. mirandum*, *L. mu* and *L. tamburinei* where it is distinctly concave.

Frons median frontal carina. The median frontal carina consists of a vertical ridge. The basal margin of the carina originates either on the upper half of the supraclypeal area or on the upper margin itself and the carina extends partly or fully to the anterior margin of the median ocellus. No species-group clustering of the character states (reaching/ not reaching median ocellus) was recorded. In some species, due to weakness of the upper half of the carina, it is difficult to determine whether the carina or sculpture striae reach the median ocellus. A number of species (such as *L. clariventre*) possess a small pore approximately midway along the median carina (fig. 8E). The function of this pore is unclear. A similar pore is present in other Hymenoptera (e.g. some scelionids (I.D. Naumann, personal communication)).

Antennae. The antennal characteristics discussed above dealt with most of the known interspecific variation. The male of *L. florale* differs from all other species in that the last three flagellar segments form an enlarged club. This is enhanced by colour differences; the distal segments are black on both upper and lower surfaces while the remaining flagella segments are brown above and dull yellow-brown underneath.

Clypeus. Clypeal length (CL) is not useful, but the shape and contours of the clypeus are valuable specific characters. Two species possess modifications on the anterior margin of the clypeus. *Lasioglossum megacephalum* has two lateral processes and one median process on the anterior margin, while *L. clypeatum* has two large, well separated teeth projecting from the anterior clypeal margin. In most species, the

Table 4. Cheeklist of *Lasioglossum* (*Chilalictus*) speeies with maeroeephalie development. (Note: ? indieates sex unknown.)

Speeies	Maeroeephaly			
	Female	Male	Maeroeephalie Males	
			Intermediates Present	Morphs Fully Winged
L. adustum	–	+	Yes	Yes
L. albopilosum	–	+	Yes	Yes
L. anforticornum	+	–	–	–
L. appositum	–	+	Yes	Yes
L. aspratulum	–	+	Yes	Yes
L. brunnesetum	–	+	Yes	Yes
L. bucculum	+	+	Yes	Yes
L. clypeatum	+	+	Yes	Yes
L. cognatum	–	+	Yes	Yes
L. ebeneum	–	+	Yes	Yes
L. erythrurum	–	+	Yes	Yes
L. expansifrons	–	+	Yes	Yes
L. fasciatum	–	+	Yes	Yes
L. florale	–	+	Yes	Yes
L. froggatti	–	+	Yes	Yes
L. greavesi	–	+	Yes	Yes
L. gunbowerense	–	+	Yes	Yes
L. hemichalceum	–	+	No	No
L. immaculatum	–	+	Yes	Yes
L. megacephalum	+	+	Yes	Yes
L. mirandum	–	+	Yes	Yes
L. mundulum	–	+	Yes	Yes
L. nigropolitum	+	?	?	?
L. ochroma	–	+	Yes	Yes
L. pachycephalum	–	+	Yes	Yes
L. platycephalum	–	+	Yes	Yes
L. plebeium	–	+	Yes	Yes
L. quadratum	–	+	No	Yes
L. soror	–	+	Yes	Yes
L. speculatum	–	+	Yes	Yes
L. triangulatum	–	+	Yes	Yes
L. vitripenne	–	+	Yes	Yes

supraelypeal area and elypeus are set at a distinet angle to the eontours of the frons. Several speeies, sueh as *L. bidens*, have the elypeus and supraelypeal area eontours eonfluent with those of the frons. This gives the faee a rounded appearanee in both side and frontal views. The eontours of the mesial area of the elypeus on *L. megacephalum* and *L. nefrens* are unusual as the area is strongly eoneave. The vestiture of the elypeus and lower paraoeular areas are useful male speeifie eharaeters. In many speeies, these areas are densely eovered with short, adpressed, plumose hair giving the lower faee a shining white appearanee.

Labrum. The labrum of the female is diverse and provides generalised themes used for elustering speeies-groups. Similar labrum modifieations have not been observed in other halietine genera (e.g. *Homalictus*, fig. 8A) nor within the Nomiinae (e.g. *Nomia* Latreille, fig. 8B). The labra of other Australian *Lasioglossum* subgenera seem to be less diverse. To standardise the deseription of the labrum it was subdivided into two areas; a basal box and a distal proeess (fig. 8C). The basal box provides attaehment to the head and support for the distal proeess. The anterior margin is either straight, rounded or obtusely angulate mesially. The margin in some

species is raised and strongly recurved to form a lip. The lateral areas of the dorsal surface are recessed in several species. The median area is variously elevated and sculpted. The sculpture ranges from gently raised area with a smooth or roughened surface to raised, separated or joined tubercles; if joined, the tubercles form an inverted V-shaped process. An elevated median area is present in all species except the highly unusual *L. frankenia* in which both basal and distal processes form a single process.

Examination of outgroups indicates that more advanced states of the labrum are more simple. The primitive state of the labrum is probably an undifferentiated triangular process in which the basal box and distal process are contiguous and the labrum lacks a median keel, lateral ridges, lateral teeth and setae. In presumed closely related outgroups, such as *Homalictus*, the labrum is differentiated into two separate areas though both areas remained relatively unmodified. The use and value of ornate structures on the labrum remains unclear. Correlations with floral structures, aids for communication or nest building are possible. One function of the basal box may be to produce pheromones. SEM examination revealed a row of rounded pores, each with a small blunt peg-like hair in the centre, on the distal vertical surface of the basal box. The basal box may produce pheromones which are transferred during trophallaxis. The labrum provides excellent morphological characters for anagenic differentiation and cladogenic analysis.

The distal process offers a suite of characters, most with multiple states. The simplest form of the process, as demonstrated by *L. frankenia*, is contiguous with the basal box, triangular and without a median keel or lateral teeth. The triangular shape is present in the metallic species-group (22% of species), though a median keel and grossly enlarged curved lateral ridges are present. Some species have a few small lateral teeth, but most do not. The labrum on the two non-metallic species-groups displays a wide range of variation. The basal box has neither raised tubercles nor a recurved anterior margin. The median area is gently raised towards the anterior margin and the surface sculpture varies from smooth to striate or covered with small "wart-like" processes, each with a single seta.

The distal process shape is either slightly tapered, basal width greater than distal width (54% of species), or flanged, basal width obviously less than distal width (24% of species). A median keel is present and generally extends to the distal margin. In dorsal view, the medial keel is usually narrow, parallel sided and smooth dorsally, although in several species the distal end is spatulate. The median keel of four species, *L. bucculum*, *L. clypeatum*, *L. latichilum* and *L. megacephalum*, is small and restricted to the basal half of the distal process while the median keel of another 18 species extends well beyond the distal margin. The majority of species (76%) possess lateral ridges. Most species have ridges that either reach or almost reach the distal margin. The shape of the lateral ridges varies from straight to recurved towards the basal end of the median keel. The sculpture of the dorsal margin ranges from smooth to coarsely serrate. The possession of teeth on the lateral margins is an advanced character state. The total number of teeth corrolated with species-groupings in the following clusters; 2–3, 4–7 and 8–10. Tooth shape varies from straight to, the more commonly observed, distally curved backwards. Forward curving was not recorded. The margins of the lateral teeth are smooth, except in *L. mirandum* in which the posterior margin of each tooth is pectinate.

All species possess lateral setae distally curved in a forward direction. These setae are apically pointed, with basal setae generally longer than distal setae. However in one species-group (e.g. *L. bicingulatum*) the distal setae are distinctly longer than the preceeding setae. The setae of most species originate on the margin itself, but several species have setae which originate submarginally at a distance either less than or greater than the diameter of the seta. The distal margin of the distal process is usually rounded or gently sinuate except in one species-group where the margin is strongly emarginate on each side of the median keel.

The labrum of the male is a simplified structure consisting of a elongate, narrow basal box and, if present, a small rounded distal process. The distal process lacks a median keel, lateral ridges and lateral teeth. In four species the labrum of the male is a similar shape and size to that of the female, i.e. large and broad, with a reduced median keel, without lateral ridges, and with lateral teeth reduced or lacking. In three of these species, the distal setae insert submarginally. I consider a labrum shape similar to that of the female to be the primitive state while the simplified structure is more advanced.

Mandibles. Halictids are generally ground-nesting or occasionally wood-nesting bees (Sakagami and Michener, 1962; Michener and Fraser, 1978) and use their mandibles to assist exca-

vation of sand, soil, clay or wood. The mandibles of the female are typically elongate with a rounded apex and a small, apically rounded preapical tooth (fig. 9A). Three species, *L. edentulatum*, *L. megacephalum*, and *L. nefrens*, have no preapical tooth (e.g. fig. 9B), and the preapical tooth on *L. brochum* and *L. nigropolitum* is grossly enlarged and set at almost a right angle to the main axis of the mandible (figs 9C–D).

Mouthparts. Three species display unusual elongation or development of the mouthparts (*L. abrophilum*, *L. eremophilum* and *L. frankenia*). The mouthpart enhancements are unique to each species and usually involve modification of several sclerites. The primary area of elongation in *L. abrophilum* is the glossa with secondary elongation of the labial palpi and frons. *L. eremophilum* has primary maxillary palpi elongation with secondary glossal elongation. Increased head length, through lengthening of the frons and clypeus, is an additional secondary elongation. *L. frankenia* demonstrates primary elongation of the prementum with marked enlargement of the frons and supraclypeal area. Secondary elongation of the maxillary palpi occurs yet the glossa is not significantly elongated. All three species inhabit desert areas. The mouthpart and proboscidial modifications have probably arisen to enhance nectar collection from specific floral types and these species may now be monolectic feeders on these flowers. The presumed floral associations are *L. abrophilum* and *L. frankenia* on *Frankenia* L. and *L. eremophilum* on *Eremophila*.

Vertex. Two species, *L. bucculum* and *L. megacephalum*, have a broad vertex. (See *Remarks* on *L. megacephalum* for discussion on head enlargement.)

Genae. The genae of the female are normally rounded and enlarged in species with a broad vertex. The possession of a large, slender process on each gena is unique to *L. anforticornum*. The genae of the male are similar to those of the female except in macrocephalic males in which the genae may be enlarged and rounded or enlarged with the basal margin straight, sometimes with an apical boss.

Proboscidial fossa. Lasioglossum megacephalum is the only species in which the carina surrounding the proboscidial fossa is enlarged and raised above the general surface.

Sculpture. Sculpture of the head is either striate, reticulate or rugose and not informative for cladistic analysis. The punctation frequency on the clypeus differentiated species but often demonstrated intraspecific variation.

Vestiture. The head vestiture of the female is generally sparse except in *L. albopilosum* which has a dense cover of short, white, adpressed hair on the frons, paraocular areas and supraclypeal area, although the clypeus is almost glabrous. The head vestiture of the male is more variable with pubescence on the lower frons, lower paraocular areas, supraclypeal area and clypeus either sparse or dense, i.e. consisting of short, plumose, white, adpressed hairs that give the lower face a white shining appearance. Exceptions are five species with long, branched hairs on the genae (a "beard") and four species with conspicuously long hairs on the eyes (males only).

Colour. The female head colour is usually similar to the mesoscutum, except in a few species where the colour is similar to the propodeum. These exceptions occur in the non-metallic species-group where metallic markings are present on the mesoscutum only (*L. cognatum*, *L. eremean* and *L. metallicum*). Head colour is usually uniform. Several exceptions occur in both the metallic (e.g. *L. fasciatum*, *L. gunbowerense*) and non-metallic species-groups (e.g. *L. albopilosum*, *L. ochrochilum*, *L. morense*) in which the clypeus is either basally or entirely light brown to ochre.

The head of the male is generally black or tinged with a metallic colour although colour varies on both the clypeus or antennal scapes. *Lasioglossum* s.l. males usually possess a dull white or yellow (in some species bright yellow) marking on the anterior half of the clypeus. However, the clypeus on the male of 12 non-metallic species is entirely black. In summary, the clypeus of the male is either anterior half yellow, remainder black, or white (due to a cover of dense white hairs), or entirely black.

The antennal scape is usually black or dark brown except eight metallic species have the apical one-third or entire scape with yellow markings.

Mesosoma

Pronotum. The shape of the dorsolateral angles of the pronotum and the sculpture on the lateral vertical surfaces are useful characters. In general, the dorsolateral angles are projected and appear as a pair of protrusions, in dorsal view, extending from the anterolateral corners of the mesoscutum. However, the dorsolateral angles of 21 species, comprising both metallic and non-metallic species are rounded and do not project from the pronotum surface. Dorsolateral angles, when projected, are either rounded, or obtusely or acutely angular. The rounded state is

more common and only eight species possess acute angles. The vertical surface sculpture of most species ranges from smooth to a few weak vertical striae. The dorsolateral angles of *L. megacephalum* are grossly enlarged and flanged laterally. The vertical surface on this species is coarsely striate with the striae extending to the apex of the dorsolateral angle.

Mesoscutum. The anterior margin of the mesoscutum is generally rounded. The mesoscutum is generally wider at the level of the anterior margin of the tegula than at its posterior margin. Two lateral parapsidal lines are present on the posterior two-thirds and the midline is sometimes marked anteriorly by a shallow furrow. The anterior margin of 25 species is strongly projected mesially as either a single rounded or a bilobed rounded extension (fig. 10D). This extension slightly overhangs the pronotum (fig. 10C). All species with a mesially projected anterior margin belong to the non-metallic species-group, except one metallic-group species, *L. hemichalceum*, which occurs throughout the non-metallic species range. Species with a bilobed projection usually are larger (length > 8mm).

The length of the mesoscutum is less than or equal to 0.8 × the width. Generally, the mesoscutum, in dorsal view, appears obviously wider than long. However, the length of the mesoscutum in *L. mesostenoideum*, *L. quadratum* and *L. smaragdinum* is equal to or greater than 0.9 × width and in dorsal view the mesoscutum appears parallel-sided with the length and width almost equal. In addition to the unusual mesoscutum, the head of these three species is square rather than the more usual triangular and tapering below.

For descriptive purposes, the mesoscutum can be divided into five discrete areas (fig. 3C): (1) anteromesial; (2) anterolateral; (3) mesial; (4) laterad of parapsidal lines; (5) parapsidal areas. The sculpture of the anteromesial area is relatively uniform with a fine tessellate or reticulate pattern while the anterolateral areas are usually smooth to weakly reticulate. However, the anterolateral mesoscutum sculpture on some non-metallic species is either scabrous (species longer than 8mm with well-defined dorsal carinae on the propodeum) or plicate with strong semi-circular striae (species 5–8mm in length and without dorsal carinae on the propodeum). The median mesoscutum sculpture ranges from smooth and highly polished (e.g. *L. nefrens*), to dull, coarsely reticulate and striate (e.g. *L. colonium*). Most species are punctate and extreme conditions are rare. A few species are "doubly-punctate" (*sensu* McGinley, 1986), with two different size punctures. The terminology used to describe the punctation frequency involves an estimation of the distance between punctures (sparse, open, close and dense, see p. 3 for an explanation of these terms), rather than determining the diameter of each puncture with respect to other species.

The punctation frequency on the area laterad of the parapsidal line usually differs from the mesial punctation and more often is that of the parapsidal areas. This small linear area is defined to avoid confusion when viewing the mesial punctation (which some may consider to be the area between the parapsidal lines) and its punctation frequency is often greater than that found mesially. However, the punctures in these areas are usually smaller and the frequency more difficult to define.

The vestiture on the mesoscutum generally consists of sparse, erect, branched hairs and in 6 species is sufficiently dense that a pattern is discernible. In these species, the vestiture comprises dense short, adpressed and minutely plumose hair closely arranged to form a tomentum. Patterns created by such hair vary from encircling the mesoscutum (e.g. *L. amplexum*) to fully covering the mesoscutum (e.g. *L. albopilosum*).

Scutellum. The sculpture on the scutellum often mirrors, to a lesser degree, that found on the mesoscutum. In many species, the mesolateral areas are sparsely punctate or impunctate and usually shining. The length of the scutellum was compared to the dorsal length of the propodeum and in 73% of species the scutellum was longer. In the metallic species-group, the length of the scutellum is equal to or shorter than the length of the dorsal surface of the propodeum.

Metanotum. The metanotum varies little in sculpture or size but vestiture may differ between species.

Propodeum. The propodeum of the female provides an array of useful species-group characters. On the dorsal surface these include: presence or absence of posterior carinae (and, if present, their position), dorsal sculpture, and posterior dorsal rim shape. The propodeum of the male is generally similar to the female, although characters are usually less well developed. In 34% of species, carinae which are present on the female propodeum are absent on the associated male. The dorsal surface of the propodeum in the metallic species-group, is always defined by carinae, but these may be present or absent in the non-metallic species-group. In

some species, the lack of a carina is possibly a reversed character state (e.g. *L. amboquestrum*). The propodeal carinae are usually posterolateral and rarely cross the posterior margin. When posterolateral, the carinae occur at the same level of the dorsal surface or well below that level. In some species (e.g. *L. nigropolitum*), the posterolateral carinae are prominent and strongly angular forming deeply recessed corners. The carina on several large (length>8 mm), non-metallic species crosses the posterior margin and is strongly recurved posteriorly to form an elevated lip (figs 12A–D, e.g. *L. tamburinei*). Lateral and posterolateral carinae at the dorsal surface level with flanged posterolateral corners define another non-metallic species-group (fig. 10E, e.g. *L. orbatum*), while a group of 11 large non-metallic species has the posterior rim of the propodeum raised to form a blunt angular lip which is recessed mesially (fig. 12B, e.g. *L. speculatum*). The dorsal surface sculpture is either ruguloso-striolate, (77%, including all metallic species), or striate (13%, e.g. *L. striatum*), or micro-alveolate (10%). The latter occurs usually on large species with recurved posterior carinae (e.g. *L. mu* and *L. bicingulatum*), although it is present on *L. parasphecodum* which has no propodeal carinae. The posterovertical carinae extend to the dorsal surface only in species with dorsal posterolateral carinae, otherwise the carinae are restricted to the basal third of the vertical surface. The posterovertical surface is plicate only on females with an elevated dorsal, mesially recessed posterior margin (fig. 14A, e.g. *L. seductum*).

Episternum. The mesepisternum and metepisternum sculpture generally consists of longitudinal striae. In some species, the striae are restricted to the upper half of the sclerites while in others the surfaces are smooth and shining.

Mesoventral area. I define the mesoventral area as the ventral surface area of the mesepisternum between the first and second pair of coxae. The vestiture (figs 25A–D) and the presence or absence of processes (figs 22C–F, 23A–F, 24A–E) on males are useful characters.

Pollen manipulation is an important grooming activity in bees. Jander (1976) described pollen manipulation in halictids as the process where the fore legs are pulled through the clamped mid tibiae and femur. Pollen is raked off by a tibial comb on the inner surface of each mid tibia and is then transferred to the hind leg scopae. The mesoventral area is not used in this mode of pollen manipulation. Michener et al. (1978) described *Trigona* Jurine (Apidae) pollen transferral as the movement of pollen from the fore legs to backwardly-directed hairs on the mesoventral area. Pollen is then transferred to the hind corbiculae by the mid legs.

The vestiture on the mesoventral area of the *L. (Chilalictus)* female usually consists of erect, simple setae distally curved in a posterior direction (fig. 25B). Such simple hairs are not used to store or manipulate pollen. However, a number of females (27%) possess branched hairs on the mesoventral area and pollen grains are often present on these hairs. The hairs are branched either on both sides (16%) (fig. 25A) or branched on the anterior side of the hair shaft only (11%) (figs 25C–D). The mid tibial combs of these species are fully developed. These species may be using the mesoventral area for either pollen manipulation or pollen collection. Species with hairs branched on the anterior surface of the shaft only were almost exclusively collected from *Wahlenbergia* Schrad. ex Roth flowers and I have observed these bees inside the tubular corolla. The remaining species were also recorded from *Wahlenbergia*, although the floral forage records suggests this plant genus was not their most favoured floral source.

The mesoventral hair structure of the male is simple although in several species (e.g. *L. albopilosum*) the area has a dense cover of short, white, adpressed hair and the hair is minutely plumose. The hair of *Lasioglossum pappodum* is unique and forms a dense imbricate pattern. Hairs lack a central shaft and consist of short, broad, thickened and apically rounded spears (fig. 24F). Unfortunately the female of this species is unknown.

The mesoventral area of the male is usually rounded but 21 non-metallic species possess paired processes which may be: (1) widely separated, apically rounded, set at 90° to body (5 species, see fig. 23F); (2) widely separated, apically pointed, set at 90° to body (3 species, see fig. 23B); (3) widely separated, apically rounded, backwardly directed (2 species, see fig. 22D); (4) widely separated, apically pointed, backwardly directed (2 species, see fig. 22C); (5) widely separated, apically hooked, backwardly directed (3 species, see fig. 24D); (6) juxtaposed, set at 90° to body (3 species, see figs 22E, F); (7) juxtaposed, backwardly directed (3 species, see figs 23C, D).

Non-metallic species with males that possess these processes, are generally small bees that frequent *Wahlenbergia* flowers. Most species occur throughout eastern Australia, ranging from either high altitude areas above the snow line (*L. alpinum*), through to true desert-inhabiting

species (*L. roddi*), although *L. anforticornum* occurs on the central coast of Western Australian. While the function of the processes remains unclear, it might be speculated that they are used to direct tarsi over an opening, at the base of the mesoventral area, which produces sex pheromones. The tarsi then spread the pheromones onto the sternal vestiture. Males with mesoventral processes possess unusually elaborate sternal vestiture. Kukuk and Schwarz (1988) observed males inside the nest rubbing sternal hairs on the female antennae prior to mating.

Metasoma

Metasomal terga. The metasomal tergum 1 (T1) of the female provides useful characters while the T1 characters of the male are usually similar to those of the female although not as well developed.

The T1 sculpture varies as: densely punctate across the posterior two-thirds (most common character state); densely punctate except for the posterior marginal area (17 non-metallic and 22 metallic species); impunctate and covered with fine transverse lineolation which appears as a dull sheen (7 non-metallic and 1 metallic species, *L. immaculatum*).

The T1, though reduced in the male, on both sexes of *L. mirandum* possesses a longitudinally raised, dorsally rounded keel. In parasitic Hymenoptera, such processes are often associated with retraction of the ovipositor, but this does not appear to be the situation in *L. mirandum*.

In general, the vestiture on T1 comprises a sparse cover of short, erect, weakly branched or simple hair. Tomentum, consisting of dense, short, adpressed, minutely plumose hair, occurs as lateral hair tufts only (7 non-metallic species) or extends across the dorsal surface of T1 (2 non-metallic, *L. albopilosum* and *L. megacephalum* and 1 metallic species, *L. frankenia*). Such tomentum does not constitute acarinaria as described by MeGinley (1986) for New World *Lasioglossum*. Few specimens carried mites and no mite was observed attached to, or between, the hair tufts. Acarinaria do occur on several Australian *L.* (*Ctenonomia*) species.

Tomentum on T2 is present laterally on most species (76%) and on T3–T4 always extends across the terga. Vestiture on T5 is a sparse to moderate cover of short, adpressed hair. Nineteen species, including metallic and non-metallic species have no metasomal tomentum and 12 species have the tomentum as a basal band T2.

The colour of the tergites is usually similar to that of the mesosoma, although in some species the head and mesosoma are dark while the metasoma is light red-brown. The T1 of these species is usually dark mesially or across the tergite.

Metasomal sterna. Only males possess metasomal processes which are always restricted to one sternite and are either a single median process or a paired process. Six species (3 metallic and 3 non-metallic) possess metasomal processes on S2 or S4 (figs 25E–F, 26A–D) as: (1) S2 with a single large, median-toothed process almost at 90° to the sternite (*L. cognatum*); (2) S2 with a single small, median-rounded process continuing the contours of the sternite (*L. brunnesetum*, *L. uncinatum*); (3) S4 with a single small, median-elongate process slightly elevated above contours of sternite (*L. mesostenoideum* and *L. quadratum*); and (4) S4 with an apically rounded, small, median-paired process (*L. gunbowerense*).

In both sexes, the posterior margin of each sternite is rounded or slightly sinuate except the S3 margin on the male of *L. aureopilatum* is strongly emarginate mesially.

The males of metallic and non-metallic species exhibit variable sternal vestiture. In some species it is sparse, consisting of a few small, minutely branched hairs scattered across the sterna (e.g. *L. orbatum*), but more usually it consists of long, white, plumose hair, densely arranged as lateral or median tufts or distributed evenly across the sternite. Usually vestiture patterns occur on S2–S4, while on S5 vestiture is short, adpressed hair and on S6, glabrous. Lateral hair tufts, if present, occur on S2–S4, and median hair tufts occur on S3 and S4 or only on S4. *Lasioglossum sexsetum* has, on S6, dense hair pads of erect, minutely branched, thickened hair directed anteromesially, and a distinct glabrous area along the midline.

The male of species that frequent *Wahlenbergia* flowers possess long, basally smooth and distally plumose hairs. This hair is erect basally and recurved distally to lie along the adjoining sternite. In some species, the distal portion is smooth-sided and flanged either laterally or posteriorly (e.g. *L. mesembryanthemi*). Two species, *L. argopilatum* and *L. aureopilatum*, are diagnosed primarily on the shape and colour of their sternal vestiture (except S3 emarginate on *L. aureopilatum*).

Male genitalia and associated sterna. The character set established by Do-Pham et al. (1984) in comparative studies on the male genitalia of French *Lasioglossum* s.l. and other

related halictines provided a useful guide for these studies, although the extensive measurements and penis valve examination were not undertaken here.

The gonobase is relatively unmodified and it is always shorter than the gonocoxite. The lateral margins of the gonobase may be flanged, parallel or recessed basally, with the last the most common.

In general, the contours of the gonocoxite do not continue the contours of the gonobase (fig. 44E), although some exceptions are present (fig. 54E). Detailed examination of the volsellae, as studied by Dollfuss (1983) and McCordquodale and Naumann (1988) for the sphecid genus *Spilomena* Shuckard, was not conducted here as their position and shape varied little.

The vestiture of the gonocoxite varies as: (1) no setae (76% of species); (2) lateral setae only (18%, metallic and non-metallic species); (3) dorsal and lateral setae present (4%, non-metallic species only); and (4) setae present ventrally and laterally (2%, *L. megacephalum* and *L. gynochilum*). Dorsal setae occur on some species of the subgenus *L. (Parasphecodes)* (Michener, 1986). Sculpture varies only on the dorsal surface which is strongly striate in some species (e.g. *L. anforticornum*) as opposed to the more common state of smooth.

The retrorse lobes (fig. 31D) of most species are setose on the inner margin and grossly enlarged such that each lobe substantially crosses over the midline of the gonocoxite. A dense or sparse vestiture of short, simple setae is present on the majority of species although 28% of species (all metallic and several large non-metallic species), have glabrous retrorse lobes. To standardise the descriptions, the retrorse lobes were subdivided into two areas: the "ventral arm", which originates along the ventral surface of the gonocoxite, and the "ventral flange" which arises along the length of the "ventral arm", extends parallel to the gonocoxite and projects apically. In most species, the ventral flange does not taper distally along the ventral arm. The retrorse lobes are well developed in 90% of species, though only 56% of species possess ventral flanges. The retrorse lobes of 8% are either weakly developed or not present, and on *L. froggatti* and *L. tridens* the retrorse lobes are reduced to small rounded processes which arise from the base of the inner margin of the gonocoxite. Retrorse lobes are present on many halictine species, but are not present on colletine species; the presence of such lobes is therefore considered to be a derived character.

Monophyly of the subgenus is based on the length of the gonostylus which is always greater than half the gonocoxite length. In most species, the gonostyli are distally tapered or parallel-sided along the entire length. In 17 species, the distal half to two-thirds of the gonostyli are substantially enlarged. These enlarged gonostyli are either rounded or swollen distally (e.g. *L. immaculatum*), or rectangular dorsoventrally flattened processes, at right angles to the gonocoxite, that resemble a broad hood above the gonocoxite (e.g. fig. 34H).

The vestiture on the gonostyli varies from sparse to densely setose with either simple or branched hairs. Twenty species, which include only one metallic species (*L. smaragdinum*), possess long, stout, thickened setae distally that are significantly broader and longer than the surrounding vestiture. These setae are either simple or weakly branched, if branched, the branches are always apical and do not occur along the length of the shaft. Each gonostylus usually has fewer than six thickened setae, though due to their basal width, they often occupy the entire distal surface. The setae usually originate ventrally or sometimes from the apex, although, no setae originate from the dorsal surface.

The shape of the lateral margins of both the seventh (S7) and eighth (S8) sterna is uniform, although the mesial area of both sterna provides several characters. The shape of the apical margin of the mesial process on S8 is: (1) bilobed (4% of species, e.g. *L. ebeneum*); (2) narrowed and spike-like (9%, e.g. *L. inflatum*); (3) truncate (19%, e.g. *L. moreense*); or (4) rounded (79%, e.g. *L. florale*). The metallic species possess only the rounded shape while the remaining shapes occur in the non-metallic species. Although the rounded apical margin is the most common form, comparison with outgroups, in which the anterior margin of S8 is flat, indicate that rounded is an apomorphic state.

Vestiture of the mesial process on S7 and S8 is, most commonly, simple (e.g. *L. amplexum*), weakly branched (e.g. *L. immaculatum*) or, rarely, with short spine-like setae (e.g. *L. alacarinatum* and *L. cognatum*). Generally S8 is more hirsute than S7, although occasionally both sterna are glabrous (e.g. *L. hamatum* and *L. cardaleae*).

Wings

Halictid wing venation characters are useful at the ranks of family, subfamily and genus, while at the species level, the characters are rela-

tively stable although *L. (Chilalictus)* species forewing characters varied as follows. In both sexes of 8 species, the 1st m-cu enters the third submarginal cell so that both recurrent veins (i.e. 1st and 2nd m-cu) enter the third submarginal cell. The more usual halictid venation is for 1st m-cu to enter the second submarginal cell and the 2nd m-cu to enter the third submarginal cell. Michener (1980) commented on the rarity of both recurrent veins entering the third submarginal cell in his description of a new species of Philippine *Homalictus* which possessed such a venation.

The subgeneric differentiation of males of *Lasioglossum* s.l. is difficult and association of sexes usually relies on coincident collection and comparison of sculpture. Michener (1965) suggested that for *L. (Chilalictus)* the second recurrent and third transverse cubital veins were narrower and weaker than the preceding veins when compared to distal veins of equal strength in the male of *L. (Ctenonomia)*. He listed four species of *L. (Chilalictus)* which were exceptions. Of 118 *L. (Chilalictus)* species with associated males, the distal wing veins are of equal strength in 62 (53%), mainly large, non-metallic, Bassian species. All metallic species have weaker distal venation. This venation character should not be used for subgeneric separation.

Legs

The basal two-thirds of the posterior surface of the fore femora is enlarged in the male of *L. biceps* and *L. inflatum* (fig. 19E). The apex of the enlargement is broad and weakly bilobed and forms a cleft with the opposed tibiae.

Hymenoptera clean their antennae by scraping the fore legs down each antenna (Jander 1976). The antenna, of both sexes, is passed through a cleft formed by the apical tibial spur and a comb-like apparatus at the base of the basitarsus on the fore leg. In *L. (Chilalictus)* the basitarsal shape is uniform, although the shape of the apical tibial spur varies. The spur comprises a basal, laterally flattened, rectangular shaped plate and a distal, toothed process called the strigilis. The shape of the strigilis varies in females and was used by Pauly (1980) as a character to aid separation of the genera *Homalictus* and *Nomioides* Schenck from *Halictus* Latreille and *Lasioglossum s.l.*. He considered that the strigilis is fan-shaped in the former and comb-shaped in the latter two genera. Of 123 *L. (Chilalictus)* species where the female is known, 28 possess a fan-shaped strigilis. These species include all metallic species (except *L. victoriae* and *L. vitripenne*), and several non-metallic species (e.g. *L. biceps* and *L. ptyon*).

The fore basitarsus on the female of 4 species is modified and may be used either for pollen collection or for digging. In *L. cognatum*, *L. platycephalum* and *L. spatulatum* the modified structure is a single, laterally flattened, V-shaped process originating from the apex of the fore basitarsus (figs 17C–E). In *L. megacephalum*, the fore basitarsus has several elongate (longer than the basitarsus), basally thickened setae, originating from the basal dorsal area of the basitarsus (fig. 17F).

The floral forage records of these species show that all visit Goodeniaceae. Indeed, of the 114 (81♀, 33♂) specimens of *L. (Chilalictus)* collected on Goodeniaceae, 80 specimens (70%) were of *L. cognatum*, *L. platycephalum* and *L. megacephalum* (the most commonly collected species). Goodeniaceae flowers possess an indusium, a cup-shaped structure on top of the style into which pollen is shed and the fore basitarsal structures of the these species are probably used to collect pollen from it. Additional floral forage records for these species on Campanulaceae and Brunoniaceae, indicate a strong use of plants with invaginated pollen repositories.

Males of three species showed mid leg modifications. The posterior surface of the mid femora of *L. triangulatum* is enlarged to form a triangular process (fig. 19F). The posterior margin of this V-shaped process is densely hirsute with long, plumose hair. Two sympatric species, *L. lamellosum* and *L. moreense*, possess unusual, laterally flattened and elliptical plate-like flanges arising from the apical inner margin of the mid coxae. The outer surface of the plate on *L. lamellosum* is densely hirsute. Similar vestiture is not present on *L. moreense*, although the hind coxae of both species are densely hirsute with long, plumose hair.

According to Michener (1965) the hind basitibial plate is an enlargement at the base of the hind tibiae and is used to provide support as the bee moves inside nest tunnels. He described the hind basitibial plate of *L. (Chilalictus)* as short and apically rounded. Of the species examined, the hind basitibial plate of 11 non-metallic species (e.g. *L. helichrysi* fig. 18B) is apically pointed. The hind basitibial plate of *L. (Parasphecodes)* is typically apically pointed and narrow, almost parallel-sided, but in the 11 species of *L. (Chilalictus)* with the pointed apex, the plate remains broad basally. *Lasioglossum (Chilalictus)* males possess a hind basitibial plate

except in *L. blighi* (Cockerell) and *L. disclusum*.

The hind tibiae of the male of *L. megacephalum* are apically swollen (fig. 28E).

The extensive examination of the hind tibial spur conducted by Eickwort and Fischer (1963) was not done here as they concluded the spurs were informative only at the generic level (but not to separate *Halictus* from *Lasioglossum*). McGinley (1986) figured the inner hind tibial spur for each species but did not use the characters in his analysis.

The outer hind tibial spur of *L. (Chilalictus)* is usually straight and finely serrate but in *L. falcatum* and *L. lamellosum* (fig. 18F) the spur is strongly curved distally. The more usual shape of the inner hind tibial spur is with a single large tooth followed by a sinuous distal margin, was used by Michener (1965) as a subgeneric character of *L. (Chilalictus)*. This shape was common to all except but *L. bibrochum* and *L. bidens* (fig. 18D), both of which possess two large, rounded teeth, and *L. tridens* (fig. 18E) which possesses three rounded teeth.

Genus *Lasioglossum* Curtis

Lasioglossum Curtis, 1833: 448. Type species, monotypic and by original designation, *Melitta xanthopus* Kirby, 1802 (= *Lasioglossum tricingulum* Curtis).

Subgenus *Chilalictus* Michener

Chilalictus Michener, 1965: 174. Type species, by original designation, *Halictus subinclinans* Cockerell, 1915a (= *Halictus cognatus* Smith syn. nov.)

Diagnosis. Small to large bees (females 3.23–12.32 mm, males 2.93–10.78 mm); female labrum either with expanded distal process so as not to taper along its length, and with associated median keel, lateral ridges and lateral teeth, or with a simple distal process tapered along its length and basal process with median tubercles and raised, curved anterior margin, one species, (*L. frankenia* with basal and distal processes simple); female inner hind tibial spur proximally with 1–3 apically rounded teeth, distal margin sinuate, never serrate; female hind basitibial plate broad, never narrowed or parallel along its length, apically round or bluntly acute, male hind basitibial plate present (except in *L. blighi* and *L. disclusum*); male genitalia with gonostyli more than half as long as gonocoxite.

Description of female. (The most common condition is given in *italics*.) Body length 3.23–12.32 mm ($\bar{x}$=6.57 mm, SD=1.81, n=1218), head width 0.94–2.98 mm ($\bar{x}$=1.92 mm, SD=0.44, n=1218), forewing length 0.85–3.42 mm ($\bar{x}$=1.33 mm, SD=0.51, n=1218).

Structure. Head *triangular* (fig. 4F), short and *broad* to elongate, length/width ratio 0.72–1.18, inner orbits *converging*, parallel or diverging below (fig. 4A–F), median frontal carina *reaching* or not reaching median ocellus, eyes with a *sparse* cover of minute setae, a few species with dense cover of long hair (fig. 7A). Scape *reaching* at least anterior margin of median ocellus. Clypeus *short* (fig. 7C) or long (fig. 7B), *convex* or weakly concave along midline (fig. 7D) or flat, ventral margin *rounded* or possessing lateral teeth (fig. 7E) or a median process (fig. 7F), surface variously sculptured with punctation and a reticulate pattern; supraclypeal area *raised* to continuing contours of frons, sculpture as on clypeus. Frons variously sculptured ranging from smooth to striate, ruguloso-striolate or punctate, usually with minute pore situated about mid-length of median frontal carina (fig. 8E). Labrum (fig. 8C) median basal area *raised* and *smooth* (figs 42B, 80B) or forming tubercles (fig. 113B), tubercles may be joined mesially forming a large V-shaped tubercle or with raised nodules (figs 43B, 47B), anterior margin straight (figs 61B, 68B), *rounded* (fig. 46B) or obtusely angular mesially (fig. 72B), margin *continues contours* of basal process (fig. 66B) or raised forming curved lip (fig. 82B), distal process tapered (figs 55B, 75B) not tapered (figs 67B, 70B) or distally flanged (figs 64B, 66B), median keel *present, extends to distal margin* (fig. 67B), beyond distal margin (fig. 69B) or restricted to basal third (fig. 70B), lateral ridges *present* (fig. 50B) or absent (figs 69B, 70B), dorsal surface of lateral ridges *smooth* (fig. 55B) or serrate (fig. 50B), lateral teeth *present* (fig. 62B) or absent (figs 113B), *large* (fig. 74B) or small (fig. 58B), *distally hooked* (fig. 51B) or straight (fig. 58B), posterior margin of teeth *smooth* or serrate, process distal margin *rounded* (fig. 44B), straight (fig. 113B), sinuate (fig. 48B) or emarginate (fig. 50B), distal setae *originate on margin* or submarginally (figs 58B, 113B). Mouthparts (including glossa, palps and prementum) *short* or elongate (fig. 7B); each mandible with *small preapical tooth* (fig. 9A) or without preapical tooth (fig. 9B, 113D) or with enlarged preapical tooth (figs 9C, D). Genae *rounded* posteriorly or produced or possessing large spine-like process (fig. 8F). Hypostomal ridge *not* enlarged or distinctly flanged (fig. 9E). Vertex *narrow* or broadened (fig. 9F). Malar space *absent* or present (fig. 7B).

Pronotum dorsolateral angles *rounded* or

bluntly to acutely pointed (fig. 10A–B) and *projected* (fig. 10A, 113E) or not projected, lateral margin *smooth* or plicate (fig. 10B). Mesoscutum anterior margin *rounded* or with a mesial projection, sometimes over the pronotum (fig. 10C), either as single process or bilobed (fig. 10D), width *greater* or almost equal to length, sculpture highly variable ranging from scabrous or *smooth* in anterolateral corners, punctation *present* or absent, highly polished or dull if covered with reticulate pattern, striate to plicate. Scutellum *longer,* equal to or less than length of dorsal surface of propodeum. Dorsal surface of propodeum *defined* (figs 10E, 10F, 11A–F, 12A–F, 13A–F, 14A–C, 14E) or not defined (figs 14F, 15A–D) by posterolateral or posterior carinae set at (figs 10E, 10F) or well below (figs 11A–F) dorsal level or defined by angular lip along posterior margin (fig. 12E, 12F, 14D), carinae not meeting at midline (fig. 11B), or laterally flanged (fig. 11E, 11F) or meet at midline to form curved lip across the posterior margin (figs 12A–D), posterovertical carinae *reaching* (fig. 11E) or not reaching (fig. 10E) dorsal carinae, dorsal sculpture smooth (fig. 12B), alveolate (fig. 15D), *ruguloso-striolate* (fig. 11A) or striate (fig. 11B), either reaching or *not reaching* dorsal rim. Metasomal T1 *densely punctate* even (fig. 15E) or unevenly so (figs 15F, 16B), smooth (fig. 16A) or smooth only on posterior marginal area; T1 rounded or with raised median keel (fig. 16F). Mesepisternum and metepisternum *striate* to smooth. Fore leg with fore tibial spur *comb-* (fig. 17A) or fan-shaped (fig. 17B), fore basitarsus *without* or with an apical process (figs 17C–E) or elongate, basal setae (fig. 17F); BP apically *rounded* (fig. 18A) or bluntly to acutely pointed apically (fig. 18B); Inner hind tibial spur with *single* large tooth and distal margin wavy (fig. 18C) or two (fig. 18D) or three teeth (fig. 18E), outer hind tibial spur *straight* or curved (fig. 18F). Forewings with 1st m-cu entering 2nd *submarginal* cell (fig. 19A) or 3rd submarginal cell (fig. 19B).

Colour. Body colour *non-metallic* or metallic, if non-metallic usually dark coloured (*black* or brown), metasoma sometimes red-brown, if metallic entirely so or head and propodeum black with mesoscutum metallic, in both forms clypeus sometimes ventrally light red-brown; antennae and legs *brown* or *black* to light brown or suffused with yellow.

Vestiture. Body *sparse*, lower face sometimes with dense cover of short, adpressed hair forming a mat, mesoscutum *sparse* to possessing a distinct hair pattern across entire surface or around perimeter; mesoventral hair plumose (fig. 25A), *simple* (fig. 25B) or weakly branched (figs 25C, 25D), if branched, branches occur on both sides of hair shaft (fig. 25A) or branched on one side of hair shaft only (figs 25C–D); metasomal T1 *sparse* (figs 16A, B) or with lateral hair tufts (figs 16C, E) or with hair band across entire surface (fig. 16D); metasomal tomentum *present* or absent, either *laterally* or across surface.

Description of male. Body length 2.93–10.78 mm ($\bar{x}$=5.53 mm, SD=1.57, n=864), head width 0.89-2.87 ($\bar{x}$=1.67 mm, SD=0.38, n=864), forewing length 0.70–2.94 mm ($\bar{x}$ =1.45 mm, SD=0.43, n=864).

Sculpture. Similar to female except: head length/width ratio 0.70–1.2, inner orbits *converging* or slightly diverging below, clypeus *flat* or weakly convex/concave, head features and measurement sometime effected by macrocephaly (figs 6C–H), surface *smooth* and *polished* or minutely roughened, scape *not reaching* median ocellus; eyes, in frontal and side view, *rounded* or bulbous; antennae short to *moderately* long, AS2+3=AS4 (fig. 20A) or AS2+3<AS4 (fig. 20B) or AS2+3>AS4 (fig. 20C), terminal flagellar segments *tapered* or enlarged (fig. 20D). Labrum distal process *short and rounded* (fig. 21A) or with enlarged and similar to that of the female of the same species (figs 21B–D). Gena *rounded* to produced (either rounded or angular posteriorly, figs 6C–H). Mandible *simple*, subapical tooth *absent.*

Pronotum dorsolateral angles *weakly* projected to enlarged and projected. Mesoscutum, scutellum and dorsal surface of propodeum sculpture similar to female though weaker; mesoventral area *rounded* or with various paired processes (figs 22C–F, 23A–F, 24A, 24C–E) or a longitudinal groove (fig. 24B); metasomal T1 *rounded* or with median raised keel (fig. 16F); metasomal sterna *without* processes or with processes variously on S2–S4 (figs 25E, 25F, 26A–D) or emarginate on S3 (fig. 27B); fore coxae *without* or with recessed area along inner margins for reception of proboscis (fig. 20E), fore femora (fig. 19E) and mid femora (fig. 19F) with posterior enlargement or mid coxae flanged (fig. 20F), mid coxae with large, thin, elliptical, lamella-like processes, at least half length of trochanters (figs 21E, 21F), hind leg with apex swollen hind tibiae. Forewing with 2nd r-m as strong as 1st r-m (fig. 19C) or weaker than 1st r-m (fig. 19D).

Colour. Black or dull metallic; clypeus with *yellow* on ventral half or entirely black; antennal and leg colour as in female.

Vestiture. Body *sparse* except varies as: lower face with dense cover of short adpressed hair forming a mat, genae with dense cover of long hair forming a beard (fig. 22B); mesoscutum with hair pattern; fore (fig. 22A) and hind coxae (figs 21E, 21F) densely hirsute with long hair, fore trochanters with several long hairs (fig. 22A); mesoventral hair *simple* or plumose or weakly branched (on both sides of hair shaft or on one side of hair shaft only (figs 25A–D)), or imbricate with short, stiff, serrate bristles (fig. 24F); metasomal S2–S6 almost glabrous (fig. 29F) or with hair bands or tufts on S2–S6 (figs 26C–F, 27A–F, 28A–F, 29A–E, 30A–F).

Genitalia and associated sterna (figs 31A–E). Gonobase sides basally flanged, parallel or narrowed, gonobase contours *not continuing* or continuing gonocoxal contours, gonocoxite with or *without* inner, lateral, ventral or dorsal setae; gonostyli *long*, apically *rounded* or grossly enlarged (fig. 31C), vestiture dense or sparse, apically with *similar* vestiture or with several large, thickened spines; retrorse lobes *well developed* or weakly developed, *setose* or glabrous, ventral flanges *absent* or present; penis valves apically *rounded* or angular, basally *narrowed* or flanged; S8 median process apically *rounded*, tapered or truncate, *setose* or glabrous, S7 with similar, though reduced, characters.

Presumed Relationships

A phylogenetic analysis of the Australian, or indeed world, *Lasioglossum* subgenera has not yet been attempted. Therefore, the presumed relationships of *Chilalictus* are based mainly on phenetics, which may not reflect the results of a phyletic analysis. *Chilalictus* is easily separated from other Australian subgenera as follows: *Austrevylaeus* has the second transverse cubital wing vein narrower than the first, while in all other Australian subgenera the vein is as strong as the first; *Callalictus*, *Ctenonomia*, *Parasphecodes* and *Pseudochilalictus* possess a relatively simple labrum and, with the exception of *Ctenonomia*, are generally larger species than found in *Chilalictus*; *Ctenonomia* lacks a differentiated comb on the outer margin of the fore basitarsus and possesses a pectinate inner hind tibial spur; *Australictus* and *Glossalictus* possess a broad and ornate labrum, the inner hind tibial spur of the former is finely serrate and of the latter is pectinate (cf. *Chilalictus* with one to three large teeth and wavy distal margin wavy). Phenetically, *Chilalictus* appears more closely allied to *Ctenonomia* and *Austrevylaeus* than any of the remaining subgenera. Species of *Chilalictus* (with the exception of *L. polygoni*) and *Austrevylaeus* are endemic, while some species of *Ctenonomia* are extralimital.

Excluded species.

Whereabouts of type material and associated specimens unknown.

Lasioglossum (Chilalictus) darwiniellum (Cockerell)

Halictus darwiniellum Cockerell, 1932: 519.
Lasioglossum (*Chilalictus*) *darwiniellum.* — Michener, 1965: 176.

Lasioglossum (Chilalictus) dimorphum (Rayment)

Halictus erythrurus dimorphus Rayment, 1954: 31.
Lasioglossum (Chilalictus) dimorphum — Michener, 1965: 176 (*nomen nudum*).

Remarks. Michener (1965) listed this Rayment species as a *nomen nudum*. The specific epithet appeared in an article entitled *Incidence of acarid mites on the biology of bees*. He nominated the epithet as a manuscript name as he had "a comprehensive paper on this species in MS". The Rayment collection (ANIC) has a series of specimens labelled "*Halictus e. dimorphus*", collected in Vic. Dandenong, 1947–1948 (one specimen collected in Toorak, Vic.). Examination of these specimens revealed the specimen labelled "Type ♀ Tertianus" is *L. (Chilalictus) mundulum* (Cockerell) and the so-called paratypes are a combination of this species and *L. (Chilalictus) hemichalceum* (Cockerell), with the latter species the more common in the series.

Lasioglossum (Chilalictus) familiare (Erichson)

Halictus familiare Erichson, 1842: 268.
Lasioglossum (*Chilalictus*) *familiare.* — Michener, 1965: 176.

Lasioglossum (Chilalictus) infimum (Erichson)

Halictus infimum Erichson, 1942: 268.
Lasioglossum (*Chilalictus*) *infimum.* — Michener, 1965: 176.

Lasioglossum (Chilalictus) percingulatum (Rayment)

Halictus percingulatum Rayment, 1935: 708.
Lasioglossum (*Chilalictus*) *percingulatum.* — Michener, 1965: 177.

Homalictus tasmaniae (Cockerell) comb. nov.

Sphecodes tasmaniae Cockerell, 1905c: 299.
Lasioglossum (Chilalictus) tasmaniae. — Michener, 1965: 177.

Material examined. Holotype. ♂, Tasmania, Hobart (42°53′S, 147°19′E), 91-155, BM Type Hym. 17.a.594 (BMNH, type glued to a card, metasoma dissected to expose the genital capsule.)

Remarks. The morphology, in particular of the genital capsule, is typical of *Homalictus* not *Lasioglossum*. Cardale (1993) cites additional localities for *Homalictus tasmaniae* as St Helens, Tasmania (Cockerell (1918b)) and Sydney, New South Wales (Rayment (1939)). I have not viewed these specimens, nor any other specimen that I would consider to be conspecific.

Key to adult females of *Lasioglossum (Chilalictus)* of Australia

1. Dorsal surface of propodeum with carinae (figs 10E–F; 11A–F; 12A–F; 13A–F; 14A–C) or angular rim (fig. 14D), carinae either posterolateral (figs 11A–F) or across posterior margin (figs 12A–D), situated either at dorsal surface (figs 10E–F) or well below dorsal surface level (figs 11A–F) 2

— Dorsal surface of propodeum without posterior carina or angular rim, contours of dorsal surface continue onto vertical surface (figs 14F, 15A–D) 89

2 (1). Fore basitarsi with elongate setae or apical processes (figs 17C–F); forewing with first recurrent vein (1st m-cu) entering third submarginal cell (fig. 19B) 3

— Fore basitarsi without elongate setae or apical processes; forewing with first recurrent vein interstitial with 1st r-m or entering 2nd (fig. 19A) or (rarely) 3rd submarginal cell 6

3 (2). Fore basitarsi with elongate basal setae, setae longer than fore basitarsal segment (fig. 17F); ventral margin of clypeus with median process (fig. 7F); dorsolateral angles of pronotum enlarged and elevated (fig. 10A); mid coxae flanged (fig. 20F) ..... *L. megacephalum* sp. nov.

— Fore basitarsi with sclerotised apical processes (figs 17C-E); without other characters as above 4

4 (3). Fore basitarsal apical process short, not extending beyond second tarsal segment, length less than 0.10 mm (fig. 17C); dorsolateral angles of pronotum rounded, not well projected ..... *L. cognatum* (Smith)

— Fore basitarsal apical process long (figs 17D–E), extends beyond second tarsal segment, length greater than 0.15 mm; dorsolateral angles of pronotum obtuse, enlarged and well projected 5

5 (4). Mesoscutum anterior margin with mesial projection, mesially polished, sparse to openly punctate (fig. 151C) ..... *L. spatulatum* sp. nov.

— Mesoscutum anterior margin rounded, not produced forward, mesially dull, closely punctate (fig. 136C) ..... *L. platycephalum* (Rayment)

6 (2). Frons elongated, antennocellar distance equal to or greater than 30% of head width (except *L. vitripenne* (Smith) 28%); mesoscutum colour usually shades of green or blue, often with a metallic sheen, a few species ochreous, brown or black; labrum distal process shape usually triangular (cf. figs 49B, 130B) 7

— Frons not elongated, antennocellar distance less than 30% of head width; mesoscutum colour black; labrum distal process shape usually rounded or flanged (cf. figs 8C; 119B) 37

7 (6). Glossal length greater than (1.06 ×) head width (fig. 5A) ..... *L. abrophilum* sp. nov.

— Glossal length less than head width 8

8 (7). Clypeus pale white-yellow, remainder of body ochreous tinged with light red-brown; lower paraocular areas almost bare, few simple setae (fig. 7C) ..... *L. ochroma* sp. nov.

— Clypeus and body not white-yellow or ochreous; lower paraocular areas hirsute 9

9 (8). Mesoscutum dark brown or black 10

— Mesoscutum with metallic sheen, usually shades of green or blue, never brown or black 18

10 (9). Dorsolateral angles of pronotum rounded, not projecting from contours of pronotum 11

— Dorsolateral angles of pronotum obtuse, distinctly projecting from contours of pronotum 15

11 (10). Mesoscutum surface polished ..... *L. adustum* sp. nov.

— Mesoscutum surface dull, covered with fine reticulate pattern . 12

12 (11). Mesoscutum parapsidal areas close to densely punctate (fig. 49C) 13

— Mesoscutum parapsidal areas appear almost impunctate (fig. 57C) or sparsely punctate 14

13 (12). Metasoma black with posterior marginal areas brown .... *L. biceps* sp. nov.

— Metasoma red-brown except anterior half of T1 black .... *L. inflatum* sp. nov.

14 (12). Dorsal surface of propodeum sculpture reaching rim (fig. 57C); metasomal T1 distinctly punctate; body length greater than 5 mm ..... *L. bubrachium* sp. nov.

— Dorsal surface of propodeum sculpture not reaching rim (fig. 75C); metasomal T1 indistinctly punctate or appears impunctate; body length less than 5 mm ..... *L. copleyense* sp. nov.

15 (10). Clypeus ventral margin with two widely separated teeth (fig. 7E); inner margins of orbits diverge below; mesoscutum with high lustre, almost impunctat though with several minute, widely separated punctures (fig. 70C) ..... *L. clypeatum* sp. nov.

— Clypeus ventral margin without teeth; inner orbits converge below; mesoscutum distinctly punctate 16

16 (15). Mesoventral hairs simple (cf. fig. 25B); mesoscutum close to densely punctate; labrum distal setae originate slightly in from the margin (fig. 107B) ..... *L. latichilum* sp. nov.

— Mesoventral hairs branched on both sides or on anterior side of shaft only (cf. figs 25A, C, D); mesoscutum open to closely punctate; labrum distal setae originate on the margin (figs 64B, 66B) ... 17

17 (16). Mesoventral hairs branched on anterior side of hair shaft only (cf. fig. 25D); head elongate, clypeus light brown ventrally, metasoma light red-brown; mesoscutum with concentric circle lineolation .. .. *L. carpobrotum* sp. nov.

— Mesoventral hairs branched on both sides of hair shaft (fig. 25A); head broad, clypeus and metasoma black; mesoscutum without concentric lineolation ..... *L. cephalochilum* Michener

18 (9). Head elongate, supraclypeal area and clypeus produced downward and protuberant, malar space present, glossa, maxillary palps and prementum elongated (figs 5I, 7B) ..... *L. frankenia* sp. nov.

— Head with normal proportions, without above set of characters 19

19 (18). Metasomal T1 impunctate; mesoscutum surface with a few minute widely separated punctures, appears impunctate (cf. fig. 16A) .... *L. immaculatum* sp. nov.

Key to adult females of *Lasioglossum (Chilalictus)* of Australia (continued)

— Metasomal T1 densely punctate; mesoscutum surface variously punctured, never appearing impunctate 20

20 (19). Head length at least 0.9 times head width (head quadrate cf. fig. 4E) 21

— Head length less than 0.9 times head width (head triangular cf. fig. 4F) 23

21 (20). Mesoscutum densely punctate mesially (fig. 117C), interspaces dull ..... *L. mesostenoideum* sp. nov.

— Mesoscutum open to closely punctate, interspaces polished ... 22

22 (21). Mesoscutum mesially sparse to openly punctate, area mesiad of parapsidal line impunctate (fig. 149C) .. *L. smaragdinum* sp. nov.

— Mesoscutum mesially closely punctate and laterad of parapsidal lines (fig. 142C) ..... *L. quadratum* sp. nov.

23 (20). Clypeus ventral margin and legs dull yellow to red-brown 24

— Clypeus ventral margin black or dark brown; legs not with above colours 25

24 (23). Metasomal T1–T3 each with dark stripe across each tergum (banded appearance); scape brown; mesoscutum sparsely punctate in parapsidal areas (fig. 86C); labral distal process triangular (fig. 86B) .. .. *L. fasciatum* sp. nov.

— Metasomal T1 with dark colour on at least basal two-thirds, remaining terga uniform light red-brown; scape light red-brown; mesoscutum open to closely punctate in parapsidal areas (fig. 94C); labral distal process truncate distally (fig. 94B) .... *L. gunbowerense* (Rayment)

25 (23). Mesoscutum surface polished 26

— Mesoscutum surface dull 32

26 (25). Dorsal surface of propodeal mesial sculpture minutely rugulosostriolate (fig. 164C); blue and red-purple colour band across anterior one-third of mesoscutum ..... *L. vitripenne* (Smith)

— Dorsal surface of propodeal mesial sculpture reticulate; no colour band on mesoscutum 27

27 (28). Supraclypeal area surface dull, covered with fine reticulate pattern ..... *L. sexsetum* sp. nov.

— Supraclypeal area with high lustre 28

28 (27). Mesepisternum basal half dull, roughened with horizontal striae . ..... *L. appositum* (Rayment)

— Mesepisternum basal half polished, surface smooth 29

29 (28). Frons above antennal bases coarsely punctate (fig. 161A); mesoscutum polished, sparsely punctate (fig. 161C) .... *L. veronicae* (Cockerell)

— Frons above antennal bases with vertical striae; mesoscutum at least openly punctate 30

30 (29). Frons sculpture extends to anterior margin of lateral ocelli (fig. 162A); labrum distal process lateral keels narrow (fig. 162B); known distribution restricted to southern Victoria near Melbourne (not recorded since 1930s) ..... *L. victoriae* (Cockerell)

— Frons sculpture extends beyond level of anterior margin of lateral ocelli (figs 150A, 158A); labrum distal process lateral keels broad (figs 150B, 158B); known distribution Eyrean 31

31 (30). Mid femora light red-brown at least on apical half .... *L. soror* sp. nov.

— Mid femora brown to dark brown except light red-brown at knee ..... *L. triangulatum* sp. nov.

32 (25). Mesoscutum openly to closely punctate in parapsidal areas (figs 87C, 192C) 33

— Mesoscutum densely punctate in parapsidal areas (fig. 44C) .. 34

33 (32). Frons striate (fig. 92A); mesoscutum mesial punctures uniform in diameter (fig. 92C), close to densely punctate; mesoscutum colour copper ..... *L. greavesi* (Rayment)

— Frons punctate/striate (fig. 87A); mesoscutum doubly punctate (two sizes), mesial and parapsidal areas openly punctate (fig. 87C); mesoscutum colour usually green (a few blue) .. *L. florale* (Smith)

34 (33). Labrum distal process rounded (fig. 44B); mesoscutum doubly punctate, punctures posteromesially forming weak longitudinal impressed lines (fig. 44C) ..... *L. aspratulum* sp. nov.

— Labrum distal process triangular (cf. figs 82B, 101B, 122B); mesoscutum punctures uniform, not forming impressed lines posteromesially 35

35 (34). Mesoscutum anterior margin with mesial bilobed projection (fig. 99C) (specimens in Qld, NSW and Vic with mesoscutum densely punctate, punctures deeply impressed mesoscutum with distinct hair pattern, in SA and WA distance between punctures wider and hair pattern indistinct) ..... *L. hemichalceum* (Cockerell)

— Mesoscutum anterior margin rounded (mesoscutum punctures never deeply impressed, no hair pattern) (figs 82C, 122C) 36

36 (35). Metasoma red-brown with dark areas basally on T1 (mesoscutum usually green) ..... *L. erythrurum* (Cockerell)

— Metasoma black to dark brown (mesoscutum colour in some WA specimens green, usual colour shades of green, blue or blue-grey) ..... *L. mundulum* (Cockerell)

37 (6). Dorsal surface of propodeum with carinae across posterior margin, carinae forming a raised ridge (figs 12A–D); distal margin of labrum deeply recessed, lateral keels coarsely serrate (cf. figs 41B, 50B) 38

— Dorsal surface of propodeum with angular rim or carinae, carinae defined posterolaterally only (cf. figs 13A–F); not with above labral characters 42

38 (37). Metasomal T1 with median longitudinal raised keel (fig. 16F); mesoscutum polished, sparsely punctate mesially, impunctate in parapsidal areas (fig. 119C) ..... *L. mirandum* (Cockerell)

— Metasomal T1 without median keel; mesoscutum punctation with dense cover along midline and in parapsidal areas 39

39 (38). Mesoscutum mesially polished (appears to form letter M), openly punctate mesially (fig. 121C) ..... *L. nu* sp. nov.

— Mesoscutum mesial dull and close to densely punctate (cf. figs 50C, 156C) 40

40 (39). Frons concave above antennal bases (fig. 156A) not continuing contours of paraocular areas; metanotum vestiture sparse; metasomal tomentum white ..... *L. tamburinei* (Friese)

— Frons above antennal bases continues contours of paraocular areas; metanotum densely hirsute; metasomal tomentum orange-yellow or absent 41

41 (40). Mesoscutum mesial punctures contiguous or densely punctate (fig. 50C); metasomal tomentum forms orange-yellow bands; legs light amber colour ..... *L. bicingulatum* (Smith)

— Mesoscutum mesial punctures not contiguous, open to closely punctate (fig. 41C); metasomal bands absent; legs dark brown ..... *L. aquilonium* sp. nov.

Key to adult females of *Lasioglossum (Chilalictus)* of Australia (continued)

42 (37). Metasomal T1 with conspicuous areas of basal lateral tomentum (fig. 16E) ..... *L. oblitum* (Smith)
— Metasomal T1 without basal lateral tomentum 43
43 (42). Mandibular pre-apieal tooth absent (fig. 9B) 44
— Mandibular pre-apical tooth present (figs 9A, C, D) 45
44 (43). Clypeus concave mesially (fig. 7D); mesoscutum highly polished, appears impunetate, almost glabrous (fig. 123C) ..... *L. nefrens* sp. nov.
— Clypcus convex mesially; mesoseutum distinctly punetured, conspicuously hirsute (fig. 79C) ..... *L. edentulatum* sp. nov.
45 (44). Mandibular pre-apical tooth enlarged forming large rounded boss almost at right angles to main axis of mandible (figs 9C, D) .. 46
— Mandibular prc-apieal tooth normal, not enlarged (cf. fig. 9A) 47
46 (45). Head scabrous (fig. 124A), mesoseutum polished, dorsal surfaee of propodeum rugose, coarsely sculptured, propodeal posterolateral carinae forming deep V-shaped concavity, earinae as strong as postcrovcrtical carinae (fig. 11F); metasoma black ..... *L. nigropolitum* (Coekerell)
— Hcad striate (fig. 55A), mesoscutum dull, dorsal surface of propodeum minutely ruguloso-striolate, finely seulptured, propodeal posterolateral carinae not forming concavity, carinae weaker than posterovertical carinae (fig. 55C); metasoma light red-brown ..... *L. brochum* sp. nov.
47 (45). Dorsal surface of propodeum defincd by lateral earinae, posterolateral corners flanged at same level as dorsal surface (cf. fig. 10E) 48
— Dorsal surface of propodeum without posterolateral corners flanged, usually rounded and defincd by carinae below level of dorsal surfaee 52
48 (47). Frons striate (cf. fig. 43A) 49
— Frons punctate to areolate (cf. fig. 69A) 51
49 (48). Mesoscutum punctate (fig. 132C), interspaces polished ..... *L. orbatum* (Smith)
— Mesoscutum scabrous or seabrieulous, sculpture aeross entire surface, interspaccs absent 50
50 (49). Mesoscutum coarsely scabrous (fig. 43C) ..... *L. asperithorax* (Coekerell)
— Mesoscutum finely scabriculous (fig. 97C) .. *L. hapsidum* sp. nov.
51 (48). Mesoseutum punctate (fig. 145C), interspaees polished ..... *L. sculpturatum* (Coekerell)
— Mesoseutum finely scabriculous with seulpture contiguous (fig. 69C), mesial sculpture finer than lateral same ..... *L. clelandi* (Cockcrell)
52 (47). Posterovertical surface of propodeum with strong plicae eurved basally towards metasomal articulation point (ef. figs 13A–F) . 53
— Posterovertical surface of propodeum without plicae 63
53 (52). Dorsal surface of propodeum striate mesially and laterally (ef. figs 11B, 13C, 13D, 14B) 54
— Dorsal surface of propodeum sculpture not striate mesially (some species are laterally striate, see figs 13A, 13B) 59
54 (53). Tibiae and tarsi light red-brown ..... *L. conspicuum* (Smith)
— Tibiae and tarsi black or dark brown 55

55 (54). Metasomal lateral tomentum absent or minute ..... *L. nitens* sp. nov.
— Metasomal lateral tomentum well developed 56
56 (55). Dorsal surface of propodeum posterolateral carinae absent (fig. 14D) ..... *L. teltiri* sp. nov.
— Dorsal surface of propodeum posterolateral carinae present .. 57
57 (56). Mesoscutum punctation in parapsidal areas contiguous (fig. 90C) ..... *L. gilesi* (Cockerell)
— Mesoscutum punctation in parapsidal areas with smooth, shining interspaces present (figs 112C, 152C) 58
58 (57). Mesoscutum surface shining with a high lustre ..... *L. speculatum* sp. nov.
— Mesoscutum surface variously roughened, dull except small smooth shining areas laterad of midline ..... *L. littleri* (Cockerell)
59 (53). Frons sculpture coarse with vertical plicae (figs 45A, 146A); mesoscutum sculpture coarse, surface dull, anterior half with curved striae which meet along midline (figs 45C, 146C) 60
— Frons sculpture striate (figs 54A, 111A, 143A); mesoscutum punctate, interspaces polished, striae not present (figs 54C, 111C, 143C) 61
60 (59). Mesoscutum scabrous laterally, striate-punctate mesially (fig. 146C); dorsal surface of propodeum sculpture forming narrow V-shaped area, lateral margins raised, sculpture reaches lateral raised rim (fig. 14A) ..... *L. seductum* (Cockerell)
— Mesoscutum sculpture punctate laterally, striate mesially, small polished area mesial of midline (fig. 45C); dorsal surface of propodeum sculpture not forming V-shaped area, sculpture barely reaches rim (fig. 14D) ..... *L. athrix* sp. nov.
61 (59). Dorsal surface of propodeal rim rounded, not recessed mesially .. .. *L. litovillum* sp. nov.
— Dorsal surface of propodeal rim angular, broadly V-shaped, mesially recessed (figs 13A, F) 62
62 (61). Mesoscutum punctation dense on either side of parapsidal lines, puncture contiguous or densely punctate (fig. 143C); dorsal surface of propodeum without posterolateral carinae (fig. 13F) ..... *L. repraesentans* (Smith)
— Mesoscutum punctation sparse, surface polished, punctation in parapsidal areas not as above (fig. 54C); dorsal surface of propodeum with posterolateral carinae (fig. 13A) .. *L. brazieri* (Cockerell)
63 (52). Dorsal surface of propodeum striate on lateral surface (cf. figs 11D, 12E, 13E, 14C) 64
— Dorsal surface of propodeum ruguloso-striolate laterally (in some species a few weak striae at extreme lateral margin) (e.g. fig. 11E) 67
64 (63). Dorsal surface of propodeum sculpture weak, restricted to posterior half of dorsal surface, remainder of surface dull, minutely colliculate (fig. 14C); head with UID≤LID ..... *L. subplebeium* (Cockerell)
— Dorsal surface of propodeum sculpture prominent, extends almost to rim (cf. fig. 13E); head with UID>LID 65
65 (64). Dorsal surface of propodeum posterolateral carinae absent, posteromesial margin with raised lip forming sharp angle with vertical surface, mid-point strongly concave (fig. 12E) ..... *L. amboquestrum* sp. nov.

Key to adult females of *Lasioglossum (Chilalictus)* of Australia (continued)

— Dorsal surface of propodeum posteromesial margin rounded, midpoint not concave 66

66 (65). Dorsal surface of propodeum polished, striate across entire surface, posterolateral carinae weak, well below dorsal surface (fig. 13E); eyes with long setae ..... *L. polygoni* (Cockerell)

— Dorsal surface of propodeum dull, ruguloso-striolate mesially, posterolateral carinae well developed forming raised ridge at or just below dorsal surface (fig. 11D); eyes almost bare ..... *L. imitans* (Cockerell)

67 (63). Dorsal surface or at least posterior marginal area of metasomal T1 impunctate, covered with fine transverse striae; mesoventral hair minutely branched (cf. fig. 25A) 68

— Dorsal surface of metasomal T1 punctate; mesoventral hair simple (cf. fig. 25B) 70

68 (67). Mesoscutum dull with minute colliculate pattern, sparsely and indistinctly punctate (fig. 68C) ..... *L. clariventre* (Friese)

— Mesoscutum dull except polished areas mesially on either side of midline, punctation distinct (cf. fig. 91C) 69

69 (68). Mesoscutum densely punctate, except open to closely punctate and polished on posterior third of mesoscutum (fig. 116C) ..... *L. mesembryanthemi* (Cockerell)

— Mesoscutum openly punctate, parapsidal area impunctate, polished on posterior half of mesoscutum (fig. 91C) .. *L. globosum* (Smith)

70 (67). Outer hind tibial spur distally recurved, sickle-shaped (fig. 18F) 71

— Outer hind tibial spur relatively straight, not recurved (fig. 18E) 72

71 (70). Mesoscutum punctures contiguous or densely punctate, surface dull (fig. 85C) ..... *L. falcatum* sp. nov.

— Mesoscutum punctures not contiguous, open to closely punctate, interspaces present, surface polished (fig. 105C) ..... *L. lamellosum* sp. nov.

72 (70). Clypeus amber to light red-brown ventrally 73

— Clypeus entirely black to brown 75

73 (72). Metasomal tomentum on T2 present as hair band across tergum ..... *L. bicolor* sp. nov.

— Metasomal tomentum on T2 present laterally only 74

74 (73). Metasoma light red-brown, tomentum weakly present laterally T2–T3 ..... *L. ochrochilum* sp. nov.

— Metasoma brown except posterior marginal areas light red-brown, tomentum distinctly present laterally on T2, forming broad band across terga T3–T5 ..... *L. moreense* (Cockerell) (part)

75 (72). Frons above antennal bases coarsely alveolate (fig. 60A); metasomal terga with bluish-grey sheen ..... *L. caesium* sp. nov.

— Frons above antennal bases striate (fig. 114A) or reticulate (fig. 133A); metasomal terga black or brown 76

76 (75). Mesoscutum polished across entire surface, minutely and sparsely punctate (fig. 112C) ..... *L. mediopolitum* (Cockerell)

— Mesoscutum not polished across entire surface, distinctly punctate (cf. fig. 133C) 77

77 (76). Mesoscutum polished on posterior half; propodeal rim polished on posterior and lateral margins 78

— Mesoscutum dull; propodeal rim dull 79

78 (77). Mesoscutum mesial surface uneven, polished areas conspicuous, impunctate on either side of deeply furrowed parapsidal lines, punctures irregularly shaped and deeply pitted, anteriorly dull and coarsely sculptured (fig. 155C) ..... *L. supralucens* (Cockerell)

— Mesoscutum mesial surface even, polished areas small interspaces, punctures contiguous on either side of lightly impressed parapsidal lines, punctures rounded, not deeply impressed, anteriorly dull almost impunctate (fig. 133C) ..... *L. pachycephalum* (Cockerell)

79 (77). Head ovoid (fig. 4C), width at least 1.3 × length ..... *L. curycephalum* sp. nov.

— Head broad to triangular (fig. 3A), width less than 1.25 × length 80

80 (79). Mesoscutum conspicuously hirsute along lateral and posterior margin with short plumose hair (cf. fig. 38C) 81

— Mesoscutum without hair pattern along lateral or posterior margin 82

81 (80). Clypeus and supraclypeal area flat, continuing contours of frons, paraocular area with dense plumose adpressed hair, fore, mid and hind tibiae and tarsi light red-brown ..... *L. moreense* (Cockerell) (part)

— Clypeus convex, supraclypeal area projected, not continuing contours of frons, paraocular area hair not forming dense mat, legs brown ..... *L. amplexum* sp. nov.

82 (80). Dorsal surface of propodeum sculpture on basal half only, posterior half minutely alveolate to smooth 83

— Dorsal surface of propodeum sculpture extending at least half way to rim 85

83 (82). Metasomal T1 polished, minutely sparse to openly punctate on anterior half; inner hind tibial spur with three teeth (fig. 18E) ..... *L. tridens* sp. nov.

— Metasomal T1 dull or interspaces polished, distinctly densely punctate on anterior half; inner hind tibial spur with one or two teeth (cf. figs 18C, D) 84

84 (83). Clypeus dull, covered with fine reticulate pattern; mesoscutum mesially close to densely punctate; mesoventral hair branched on anterior side of hair shaft only (cf. fig. 25D) ..... *L. gynochilum* Michener

— Clypeus smooth and polished; mesoscutum mesially open to closely punctate; mesoventral hairs simple (fig. 25B) ..... *L. plebeium* (Cockerell)

85 (82). Dorsal surface of propodeum with posterolateral carinae rounded (fig. 10F); eyes with conspicuous cover of long hair ..... *L. calophyllae* (Rayment)

— Dorsal surface of propodeum with posterolateral carinae angular (cf. figs 11A–F); eyes almost bare 86

86 (85). Dorsal surface of propodeum with posterolateral carinae as strong as posterovertical carinae, forming deeply recessed angle (fig. 11C) ..... *L. ebeneum* sp. nov.

— Dorsal surface of propodeum with posterolateral carinae weaker than posterovertical carinae, forming shallow recessed angle (e.g. fig. 11A) 87

87 (86). Mesoscutum anterolateral sculpture scabrous (fig. 72C); metasomal T1 posterior marginal area shining, sparsely punctate ..... *L. colonicum* (Rayment)

— Mesoscutum anterolateral sculpture finely punctate; metasomal T1 posterior marginal area dull, densely punctate 88

Key to adult females of *Lasioglossum (Chilalictus)* of Australia (continued)

88 (87). Metasomal T1 with dense even punctation across surface (fig. 15E) ..... *L. chapmani* (Cockerell)

— Metasomal T1 with uneven punctation, lateral areas impunctate (fig. 16B) ..... *L. expansifrons* (Cockerell)

89 (1). Occiput broad, length subequal to ocellocular distance (fig. 9F) .. .. *L. bucculum* sp. nov.

— Occiput narrow, length less than ocellocular distance 90

90 (89). Metasomal T1 with tomentum at least laterally (figs 16C–E) .. 91

— Metasomal T1 without tomentum 96

91 (90). Clypeus with apical half amber to light red-brown 92

— Clypeus black (some species dark brown ventrally) 93

92 (91). Metasomal T1 with tomentum across entire surface mesially (fig. 16D); head width less than 1.2 × length . *L. albopilosum* sp. nov.

— Metasomal T1 with tomentum laterally only (cf. figs 16E); head width greater than 1.2 × length ..... *L. alacarinatum* sp. nov.

93 (91). Mesoscutum metallic 94

— Mesoscutum black 95

94 (93). Frons reticulate (fig. 80A); mesoscutum punctures in parapsidal areas with interspaces (fig. 80C); hind basitibial plate obtuse apically (cf. fig. 18B) ..... *L. eremaean* sp. nov.

— Frons with vertical striae (fig. 118A); mesoscutum punctures in parapsidal areas contiguous, interspaces absent (fig. 118C); hind basitibial plate rounded apically (cf. fig. 18A) .... *L. metallicum* sp. nov.

95 (93). Known distribution in south-west Western Australia (fig. 65D); (distinguished from *L. pollux* sp. nov., *L. pulvitectum* by male genitalia) ..... *L. castor* sp. nov.

— Known distribution in north central Western Australia near Onslow (fig. 138A) ..... *L. pollux* sp. nov.

— Known distribution in eastern states and South Australia (fig. 141D) ..... *L. pulvitectum* (Cockerell)

96 (90). Fore tibial spur fan-shaped (cf. fig. 17B); metasomal T1 impunctate ..... *L. ptyon* sp. nov.

— Fore tibial spur comb-shaped (cf. fig. 17A); metasomal T1 punctate 97

97 (96). Mesoscutum anterolaterally with transverse curved plicae or striae (fig. 147C) 98

— Mesoscutum anterolaterally without plicae or striae, either smooth, punctate or scabrous 101

98 (97). Mesoscutum anterolateral plicae extend to posterior margin of parapsidal lines (fig. 147C); lateral margins of propodeum striate .... *L. seminitens* (Cockerell)

— Mesoscutum anterolateral plicae not extending into parapsidal areas (cf. fig. 128C); lateral margins of propodeum smooth 99

99 (98). Dorsal surface of propodeum smooth, covered with minute reticulate pattern, few weak striae along anterior margin (fig. 115C); body length greater than 9 mm ..... *L. melanopterum* (Cockerell)

— Dorsal surface of propodeum roughened; body length less than 9 mm 100

100 (99). Dorsal surface of propodeum striate (fig. 15C), length greater than scutellum length; mesoscutum openly punctate mesially (fig. 153C) ..... *L. striatum* sp. nov.

— Dorsal surface of propodeum weakly striolate to rugulose (fig. 128C), not as long as scutellum; mesoscutum densely punctate mesially (fig. 128C) ..... *L. occidens* sp. nov.

101 (97). Dorsal surface of propodeum smooth (fig. 15D); metasoma amber to light red-brown ..... *L. parasphecodum* sp. nov.

— Dorsal surface of propodeum roughened; metasoma dark brown or black 102

102 (101). Anterior margin of metasomal T1 impunctate 103

— Anterior margin of metasomal T1 punctate 104

103 (102). Mesoscutum smooth, covered with fine reticulate pattern, indistinctly punctured to impunctate in parapsidal areas (fig. 131C); dorsal surface of propodeum weakly ruguloso-striolate (fig. 15D) . ..... *L. opacicolle* (Cockerell)

— Mesoscutum roughened, scabrous anterolaterally, parapsidal areas coarsely sculptured, scabrous to punctate, punctures contiguous (fig. 47C); dorsal surface of propodeum weakly striolate, alveolate across surface (fig. 15A) ..... *L. baudini* (Cockerell)

104 (102). Head elongate, length subequal to width; maxillary palpi elongate, 0.75 × head width ..... *L. eremophilum* sp. nov.

— Head broader than long; maxillary palpi less than half head width 105

105 (104). Body length greater than 6 mm 106

— Body length less than 6 mm 115

106 (105). Forewings with first recurrent vein (1st m-cu) entering third submarginal cell (cf. fig. 19B) or interstitial with 1st r-m; dorsal surface of propodeum with sculpture on basal half only, remainder smooth and polished (fig. 52C), contours continue onto vertical surface; inner hind tibial spur with two teeth (fig. 18D) .... *L. bidens* sp. nov.

— Forewings with first recurrent vein entering 2nd submarginal cell (cf. fig. 19A); dorsal surface of propodeum roughened, distinct delineation between dorsal and vertical surfaces; inner hind tibial spur with single tooth (fig. 18C) 107

107 (106). Hind basitibial plate obtuse apically (fig. 18B) .... *L. helichrysi* (Cockerell)

— Hind basitibial plate rounded apically (fig. 18A) 108

108 (107). Mesoscutum parapsidal arcas with interspaces smooth 109

— Mesoscutum parapsidal areas coarsely sculptured with contiguous punctation, interspaces absent 112

109 (108). Mesoscutum mesially with longitudinally striate (fig. 108C) .... *L. lineatum* sp. nov.

— Mesoscutum mesially without striae 110

110 (109). Ocellantennal areas concave; mesoscutum with dull sheen, densely punctate mesially (fig. 104C) ..... *L. instabilis* (Cockerell)

— Ocellantennal areas flat; mesoscutum with polished areas, openly punctate mesially (figs 48C, 62C) 111

111 (110). Mesoscutum polished across entire surface .... *L. cambagei* (Cockerell)

— Mesoscutum laterally polished, mesially dull with fine reticulate pat- term ..... *L. bibrochum* sp. nov.

112 (108). Frons punctate (fig. 106A); mesoscutum anterior margin with marked mesial projection, closely punctate mesially (fig. 106C); eyes with conspicuous cover of long setae (fig. 7A); body length greater than 8 mm ..... *L. lanarium* (Smith)

Key to adult females of *Lasioglossum (Chilalictus)* of Australia (continued)

— Frons reticulate (fig. 165A) to ruguloso-striolate (fig. 163A); mesoscutum anterior margin rounded, densely punctate mesially; eyes almost bare; body length less than 8 mm 113

113 (112). Mesoscutum surface dull, punctures mostly contiguous (fig. 165C) ..... *L. willsi* (Cockerell)

— Mesoscutum punctures separated, interspaces polished (figs 74C, 163C) 114

114 (113). Frons with median frontal carina reaching median ocellus (fig. 74A) ..... *L. convexum* (Smith)

— Frons with median frontal carina not reaching median ocellus (fig. 163A) ..... *L. victoriellum* (Cockerell)

115 (105). Forewings with first recurrent vein (1st m-cu) entering third submarginal cell; eyes markedly divergent below (lower interorbital distance 1.08 × upper interorbital distance, fig. 4A); some specimens with large apically pointed genal process (fig. 8F) ..... *L. anforticornum* sp. nov.

— Forewings with first recurrent vein interstitial with 1st r-m or entering 2nd submarginal cell; eyes convergent below; genal process absent 116

116 (115). Scape with basal hair tufts, hair plumose and elongate distinctly different to remaining vestiture of scape ..... *L. roddi* sp. nov.

— Scape without hair tufts 117

117 (116). Mesoventral area hairs simple (cf. fig. 25B) . *L. bullatum* sp. nov.

— Mesoventral area hairs branched (cf. figs 25A, C, D) 118

118 (117). Mesoventral area hairs branched on both sides of hair shaft (cf. fig. 25A) 119

— Mesoventral area hairs branched on anterior side of hair shaft only (cf. figs 25C, D) 120

119 (118). Mesoscutum with conspicuous cover of short dark brown hair, densely punctate (fig. 56C) ..... *L. brunnesetum* sp. nov.

— Mesoscutum without above hair cover, open to closely punctate (fig. 166A) ..... *L. xerophilum* sp. nov.

120 (119). Dorsal surface of propodeum smooth to micro-alveolate (figs 42C, 46C) 121

— Dorsal surface of propodeum roughened (figs 76C, 102C, 113C) 122

121 (120). Mesoscutum mesially open to closely punctate (fig. 46C); known only from Canberra area ..... *L. aureopilatum* sp. nov.

— Mesoscutum mesially close to densely punctate (fig. 42C); known from tablelands of southern Queensland and north eastern New South Wales ..... *L. argopilatum* sp. nov.

122 (121). Clypeus and posterior half of mesoscutum polished (fig. 111C); labrum with lateral ridges serrate (fig. 111B) ..... *L. macrops* (Cockerell)

— Clypeus and mesoscutum dull, covered with fine reticulate pattern (figs 76C, 102C); labrum with lateral keels smooth or absent (figs 76B, 102B, 127B) 123

123 (122). Dorsal surface of propodeum sculpture striolate (fig. 127C); labrum with lateral keels present (fig. 127C) ..... *L. obscurissimum* Michener

— Dorsal surface of propodeum sculpture ruguloso-striolate (figs 76C, 102C); labrum without lateral keels (figs 76B, 102B) 124

124 (123). Labrum lateral teeth strongly hooked distally (fig. 76B) ..... *L. demicapillum* sp. nov.

— Labrum lateral teeth weakly hooked distally (fig. 100B) ..... *L. humei* (Cockerell)

Key to adult males of *Lasioglossum (Chilalictus)* of Australia

1. Frons elongated, antennocellar distance equal to or greater than 30% of head width 2
— Frons not elongated, antennocellar distance less than 30% of head width 17
2 (1). Glossal length greater than 0.4 × head width 3
— Glossal length less than 0.4 × head width 4
3 (2). Glossal length equal to or greater than 0.8 × head width; clypeus not entirely protruded beyond lower level of eyes ..... *L. abrophilum* sp. nov.
— Glossal length equal to or greater than 0.45 × though less than 0.8 × head width; clypeus entirely protruded beyond lower level of eyes ..... *L. frankenia* sp. nov.
4 (3). Metasomal S4 with single median hirsute sclerotised process (figs 26C, D) ..... *L. mesostenoideum* sp. nov.
— Metasomal surface without sclerotised projections 5
5 (4). Fore femora enlarged basally (cf. fig. 19E) 6
— Fore femora not enlarged basally 8
6 (5). Fore coxae almost bare, a few short, simple adpressed hairs; S3–S5 hair posteriorly directed ..... *L. inflatum* sp. nov.
— Fore coxae distinctly hirsute, with long, erect minutely branched hair; S3–S5 hair posterolaterally or posteromesially directed ... 7
7 (6). Genital capsule with S8 median process apically truncate and bilobed (fig. 57H) ..... *L. bubrachium* sp. nov.
— Genital capsule with S8 median process apically narrowed and pointed (fig. 49H) ..... *L. biceps* sp. nov.
8 (5). Metasomal sternites with hair pattern consisting of dense rows of hair across sterna or hair tufts 9
— Metasomal sternites without hair pattern, vestiture usually includes sparse hair row across sternite 14
9 (8). Metasomal S6 densely hirsute, two lateral tufts with hair directed posteromesially (fig. 30C) ..... *L. sexsetum* sp. nov.
— Metasomal S6 not densely hirsute 10
10 (9). Metasomal S4 with median hair tuft (fig. 30A) ..... *L. quadratum* sp. nov.
— Metasomal S4 without median hair tufts 11
11 (10). Genal hair long, forming a beard (fig. 22B); antennae with scape apically yellow, distal three flagellar segments as wide as long (appear swollen, fig. 20D), remainder longer than wide, flagellum length almost 2.5 × upper interorbital distance ..... *L. florale* (Smith)
— Genal hair short, not forming a beard; antennae not as above: no yellow on scape, distal flagellar segments not as above, flagellum length equal to less than 2 × upper interorbital distance 12
12 (11). Fore coxae yellow; fore trochanters with long hairs, hairs markedly longer than vestiture on femur (fig. 22A) .. *L. fasciatum* sp. nov.
— Fore coxae not yellow; fore trochanter and femora vestiture similar 13
13 (12). Frons coarse and closely punctured ..... *L. veronicae* (Cockerell)
— Frons with vertical striae ..... *L. victoriae* (Cockerell)
14 (8). Face yellow except frons above antennal bases brown ..... *L. ochroma* sp. nov.
— Yellow on clypeus only 15
15 (14). Clypeus and supraclypeal area with dense cover of adpressed short plumose hair ..... *L. clypeatum* sp. nov.
— Clypeus and supraclypeal area without dense cover of hair ... 16

Key to adult males of *Lasioglossum (Chilalictus)* of Australia (continued)

16 (15). Mesoscutum dull, covered with fine reticulate pattern, sparsely punctured, appears rounded, width:length = 1.3; dorsal surface of propodeum sculpture extends to rim ..... *L. greavesi* (Rayment)

— Mesoscutum polished, impunctate, appears narrowed, width:length = 1.15; dorsal surface of propodeum sculpture not extending to rim ..... *L. smaragdinum* sp. nov.

17 (1). Forewing venation with 2nd r-m weaker than 1st r-m (cf. fig. 19D) 18

— Forewing venation with 2nd r-m as strong as 1st r-m (cf. fig. 19C) 59

18 (17). Mesoscutum metallic 19

— Mesoscutum black 25

19 (18). Head black; metasomal S2 with median multi-toothed process (figs 25E, F) ..... *L. cognatum* (Smith)

— Head metallic; metasomal S2 without process 20

20 (19). Metasomal S4 with two median sclerotised processes (fig. 26B); antennal scapes entirely yellow ..... *L. gunbowerense* (Rayment)

— Metasomal S4 without processes; antennal scapes not entirely yellow 21

21 (20). Metasomal S4 with median hair tuft (figs 27A, 30F) 22

— Metasomal S4 without median hair tuft 23

22 (21). Metasomal S3, S4 with median hair tufts (fig. 30F); fore and mid femora with long hair, mid femora enlarged along posterior margin and triangular (fig. 19F); dorsal surface of propodeum not defined by lateral carinae ..... *L. triangulatum* sp. nov.

— Metasomal S4 only with median hair tuft (fig. 27A); fore and mid femora without long hair, mid femora not enlarged nor triangular; dorsal surface of propodeum defined by lateral carinae ..... *L. aspratulum* sp. nov.

23 (21). Metasomal S3, S4 with hair pattern forming an inverted V shape, hair shorter mesially than laterally (fig. 30D) ... *L. soror* sp. nov.

— Metasomal S3, S4 with hair pattern forming rows across sternites, hair of equal length 24

24 (23). Genal hair long, forming a beard (cf. fig. 22B); fore coxae and trochanters densely hirsute; mesoscutum blue ..... *L. immaculatum* sp. nov.

— Genal hair short, not forming a beard; fore coxae and trochanters with a few long hairs, not densely hirsute; mesoscutum green .... *L. vitripenne* (Smith)

25 (18). Antennal scapes with some yellow, mesoscutum dark brown; metasomal S2–S4 with mesial hair, hair not extending across sternite (fig. 26E) ..... *L. adustum* sp. nov.

— Antennal scapes brown or black, mesoscutum not dark brown; metasomal S2–S4 without above hair pattern 26

26 (25). Metasomal T1 with median raised keel (cf. 16F) ..... *L. mirandum* (Cockerell)

— Metasomal T1 without medial keel 27

27 (26). Metasomal T1 impunctate 28

— Metasomal T1 punctate 29

28 (27). Genae with dense hair cover; mesoscutum polished mesially, remainder dull, surface finely reticulate; metasomal S2, S3 with dense cover of long plumose hair (fig. 28D) ..... *L. globosum* (Smith)

— Genae with sparse hair cover; mesoscutum dull, surface finely reticulate; metasomal sternal hair sparse ... *L. clariventre* (Friese)

29 (27). Clypeus entirely black 30
— Clypeus yellow/white or light brown ventrally 36
30 (29). Mesoventral area with raised ridges or elongate processes (figs 23D, F) 31
— Mesoventral area without ridges or processes 33
31 (30). Mesoventral area with two large, apically rounded, parallel processes, distance between process less than diameter of median ocellus ..... *L. bibrochum* sp. nov.
— Mesoventral area with two small processes, processes well separated forming raised ridges, distance between ridges greater than interantennal distance (cf. fig. 23F) 32
32 (31). Mesoventral processes curved towards midline ..... *L. tridens* sp. nov.
— Mesoventral processes parallel (fig. 23F) *L. gynochilum* Michener
33 (30). Antennal flagellum length greater than head width ..... *L. demicapillum* sp. nov.
— Antennal flagellum length less than head width 34
34 (33). Mesoscutum impunetate ..... *L. obscurissimum* Michener
— Mesoscutum punctate 35
35 (34). Inner margins of eyes strongly diverged below (UID:LID=1.1); mesoscutum dull; mesosternal S2–S4 with dense cover of short, minutely branched hair ..... *L. humei* (Cockerell)
— Inner margins of eyes weakly diverged below (UID:LID=1.3); mesoscutum shining; mesosternal S2–S4 with sparse cover of long, erect, simple and minutely branched hair . *L. macrops* (Cockerell)
36 (29). Clypeus light brown ventrally, remainder black ..... *L. platycephalum* (Rayment)
— Clypeus yellow-white ventrally, remainder black 37
37 (36). Antennal flagellum length greater than head width 38
— Antennal flagellum length less than head width 50
38 (37). Mesoventral area without processes 39
— Mesoventral area with processes 43
39 (38). Metasomal S2–S4 with rows of long plumose hair across sternites (fig. 29C) ..... *L. mediopolitum* (Cockerell)
— Metasomal S2–S4 without rows of long plumose hair 40
40 (39). Mesoscutum anterior margin with mesial projection ..... *L. hemichalceum* (Cockerell)
— Mesoscutum anterior margin rounded 41
41 (40). Head and mesoscutum dark green ..... *L. appositum* (Rayment)
— Head and mesoscutum black 42
42 (41). Antennal flagellum length greater than 1.8 × head width; mesoscutum smooth and polished ..... *L. erythrurum* (Cockerell)
— Antennal flagellum length less than 1.8 × head width; mesoscutum smooth, covered with fine reticulate pattern ..... *L. mundulum* (Cockerell)
43 (38). Mesoventral processes as broad raised ridges (figs 23A, 24A) 44
— Mesoventral processes as elongate projections (cf. figs 22C, E, F; 23C, D) 45
44 (43). Metasomal S2 with small median rounded process (fig. 26A), S3, S4 with erect hair ..... *L. brunnescens* sp. nov.
— Metasomal S2 without median process, S3, S4 with long adpressed hair, distal tips directed posterolaterally (fig. 29D) ..... *L. mesembryanthemi* (Cockerell)
45 (43). Mesoventral processes separated by distance less than diameter of median ocellus (figs 22C, E, F; 23C, D) 46

Key to adult males of *Lasioglossum (Chilalictus)* of Australia (continued)

— Mesoventral processes separated by distance greater than diameter of median ocellus 48

46 (45). Mesoventral processes densely hirsute on outer margins, apically curved towards midline forming a hollow basal area (fig. 22C); metasomal S4 glabrous ..... *L. alpinum* sp. nov.

— Mesoventral processes bare on outer surfaces, not curved apically (figs 22E, F, 23C, D); metasomal S4 hirsute 47

47 (46). Mesoventral processes hirsute on inner margins (fig. 22F); mesoscutum smooth, highly polished, almost impunctate ..... *L. anforticornum* sp. nov.

— Mesoventral processes bare on inner margins (fig. 23D); mesoscutum polished though distinctly punctate . *L. cardaleae* sp. nov.

48 (45). Mesoventral processes separated by distance less than interocellar distance, processes apically rounded (fig. 22D) ..... *L. argopilatum* sp. nov.

— Mesoventral processes separated by distance greater than interocellar distance, processes apically pointed (figs 23B, 24C) 49

49 (48). Mesoventral area densely hirsute (fig. 24C); clypeus basally almost bare ..... *L. plebeium* sp. nov.

— Mesoventral area hair sparse (fig. 23B); clypeus basally with dense cover of white adpressed plumose hair ..... *L. bullatum* sp. nov.

50 (37). Mesoventral area without processes; metasomal T1 with lateral hair tufts 51

— Mesoventral area with processes; metasomal T1 without lateral hair tufts 52

51 (50). Metasomal sterna almost bare ..... *L. alacarinatum* sp. nov.

— Metasomal sterna with long plumose hair on S2–S4 ..... *L. bidens* sp. nov.

52 (50). Mesoventral processes separated by distance less than diameter of median ocellus (cf. figs 22E, F) 53

— Mesoventral processes separated by distance greater than diameter of median ocellus (cf. fig. 23E) 54

53 (52). Frons, paraocular areas, supraclypeal area and clypeus with dense cover of adpressed plumose hair, antennal scapes with long tufts of plumose hair along inner margins; metasomal sterna S2–S4 with medial tufts of plumose hair ..... *L. roddi* sp. nov.

— Face and antennal scapes with sparse hair cover; metasomal sterna with sparse hair cover ..... *L. froggatti* sp. nov.

54 (52). Mesoventral processes directed at right angles to body, apically pointed (cf. fig. 23E) or broadly rounded (cf. fig. 22D) 55

— Mesoventral processes directed posteriorly at oblique angle to body, apically hooked (cf. fig. 24D) 57

55 (54). Mesoventral processes broadly rounded (cf. fig. 23F) ..... *L. grumiculum* sp. nov.

— Mesoventral processes apically pointed (cf. fig. 23E) 56

56 (55). Mesoventral processes acutely pointed apically (fig. 23E); metasomal S2–S4 with medial long plumose white tufts of hair ..... *L. cephalochilum* Michener

— Mesoventral processes rounded to obtuse pointed apically; metasomal S2 with row of long plumose, white hair across sternite, S3, S4 with short simple adpressed, posteromesially directed golden coloured hair across sternites except hair absent mesially (fig. 27B) ..... *L. aureopilatum* sp. nov.

57 (54). Metasomal S2 with small, raised median process (cf. fig. 26A) ..... *L. uncinatum* sp. nov.

— Metasomal S2 rounded, without median process 58

58 (57). Mesoscutum polished, interspaces smooth; dorsal surface of propodeum ruguloso-striolate on posterior half ..... *L. hamatum* sp. nov.

— Mesoscutum polished mesially, laterally dull, interspaces smooth except along midline series of minute longitudinal striae; dorsal surface of propodeum smooth, surface minutely alveolate ..... *L. carpobrotum* sp. nov.

59 (17). Dorsal surface of propodeum defined by carinae laterally, posterolaterally or across posterior margin 60

— Dorsal surface of propodeum not defined by carinae 76

60 (59). Posterovertical surface of propodeum with transverse curved plicae which extend almost to dorsal surface level 61

— Posterovertical surface of propodeum without plicae (some species with minute striae at base of posterovertical surface, not extending to dorsal surface) 68

61 (60). Metasomal S3, S4 with lateral hair tufts, hair longer laterally than mesially (fig. 28F) ..... *L. littleri* (Cockerell)

— Metasomal S3, S4 without lateral hair tufts, hair equal length across sternite 62

62 (61). Metasomal vestiture with few minute branches ..... *L. litovillum* sp. nov.

— Metasomal vestiture plumose 63

63 (62). Tibiae, tarsi, mid and hind femora and metasomal vestiture light red-brown ..... *L. conspicuum* (Smith)

— Legs brown or black, metasomal vestiture white 64

64 (63). Mesoscutum anterolaterally and parapsidal areas scabrous ..... *L. seductum* (Cockerell)

— Mesoscutum without scabrous areas, interspaces between punctures smooth 65

65 (64). Mesoscutum anteriorly with transverse curved plicae meeting along midline, lines continue along midline to posterior margin ..... *L. athrix* sp. nov.

— Mesoscutum without transverse plicae anteriorly or along midline 66

66 (65). Mesoscutum mesially distinctly punctured, punctures separated by distance less than diameter of puncture ..... *L. gilesi* (Cockerell)

— Mesoscutum sparsely punctured, punctures separated by distance greater than diameter of puncture 67

67 (66). Frons densely covered with adpressed plumose hair; metasomal T1 mesial punctures separated by distance greater than diameter of puncture ..... *L. speculatum* sp. nov.

— Frons sparsely covered with erect simple or branched hair; metasomal T1 mesial punctures separated by distance less than diameter of puncture ..... *L. brazieri* (Cockerell)

68 (60). Antennae elongate, ratio of flagellum length to upper interorbital distance equal to, or greater than 2.7 69

— Antennae not elongate, ratio of flagellum length to upper interorbital distance less than 2.7 71

69 (68). Ratio of flagellum length to upper interorbital distance approximately 3.3; posterior carinae of dorsal surface of propodeum forming raised lip; metasomal S4 with lateral hair tufts ..... *L. tamburinei* (Friese)

— Ratio of flagellum length to upper interorbital distance equal to 3 or less; posterior carinae of dorsal surface of propodeum not forming raised lip; metasomal S4 not forming lateral hair tufts 70

Key to adult males of *Lasioglossum (Chilalictus)* of Australia (continued)

70 (68). Mesoscutum mesial punctation dense, punctures separated by distance equal to or less than diameter of puncture; metanotum with dense hair cover; metasomal S4 with posterolaterally directed hairs ..... *L. bicingulatum* (Smith)

— Mesoscutum mesial punctation sparse, punctures separated by distance greater than diameter of puncture; metanotum with light hair cover; metasomal S4 with posteriorly directed hairs ..... *L. mu* sp. nov.

71 (69). Mid coxae with posteriorly extended processes, process broad and flattened (figs 21E, F); hind coxae densely hirsute 72

— Mid coxae without processes; hind coxae without excessive vestiture 73

72 (71). Tibiae and apical margin of metasomal T1–T4 light red brown; metasomal tomentum on T3–T5 extends across tergite; metasomal S5 without erect hair tufts ..... *L. moreense* (Cockerell)

— Tibiae and apical margin of metasomal tergites brown; metasomal tomentum laterally only; metasomal S5 with two median erect hair tufts (figs 29A, B) ..... *L. lamellosum* sp. nov.

73 (71). Clypeus entirely black; head broad, head width 1.6 × head length ..... *L. eurycephalum* sp. nov.

— Clypeus with dull white/yellow marking on ventral half; head triangular, head width 1.2 × head length 74

74 (73). Dorsal surface of propodeum rugose, coarsely roughened over entire surface, posterolateral carinae form deep concave impressions; (most specimens with light red-brown legs, few eastern specimens with brown legs) ..... *L. ebeneum* sp. nov.

— Dorsal surface of propodeum weakly ruguloso-striolate or striolate, sculpture not reaching rim mesially, posterolateral carinae not forming concave impressions (all specimens with brown legs, few with light red-brown tibiae and tarsi) 75

75 (74). Dorsal surface of propodeum ruguloso-striolate, rim smooth and shining; metasomal S5 with rows of long hair, vestiture similar to S2–S4 ..... *L. nefrens* sp. nov.

— Dorsal surface of propodeum striolate, rim dull covered with fine reticulate pattern; metasomal S5 without rows of long hair, markedly different vestiture to S2–S4 ..... *L. imitans* (Cockerell)

76 (59). Metasomal T1 with either lateral hair tufts or a hair band across tergite (cf. figs 16C–E) 77

— Metasomal T1 with sparse hair on tergite 79

77 (76). Mesoscutum metallic (usually green/blue); metasomal T1 with lateral hair tufts ..... *L. eremaean* sp. nov.

— Mesoscutum black; metasomal T1 with hair band across tergite 78

78 (77). Head macrocephalic, occiput and genae enlarged, eyes not converging below; clypeus, supraclypeal area and mesoscutum with sparse hair cover; mesoventral area with adpressed short plumose hair; hind tibiae enlarged basally (fig. 28E) ..... *L. megacephalum* sp. nov.

— Head normal, occiput and genae not enlarged, eyes converging below; clypeus, supraclypeal area and mesoscutum with dense hair cover; mesoventral area with dense cover of minute adpressed hair; hind tibiae not enlarged basally ..... *L. albopilosum* sp. nov.

79 (76). Metasomal T1 impunctate; metasomal S3–S4 with long hair across sterna forming lateral tufts (fig. 29E) .... *L. opacicolle* (Cockerell)

— Metasomal T1 punctate; metasomal S3–S4 without above vestiture 80

80 (79). Metasomal S3 with dense vestiture across sternite, S4 with lateral and median tufts, S4 vestiture less hirsute than S3 (fig. 30E) ..... *L. teltiri* sp. nov.

— Metasomal S3–S4 vestiture not as above 81

81 (80). Metasomal S3–S4 vestiture forming lateral hair tufts, either hair absent mesially or lateral hair longer than mesial hair (cf. figs 27F, 27C) 82

— Metasomal S3–S4 vestiture not forming lateral hair tufts (cf. fig. 29F) 84

82 (81). Metasomal S3–S4 with mesial hair present, dense vestiture across S2 (fig. 27C) ..... *L. baudini* (Cockerell)

— Metasomal S3–S4 with mesial hair absent, sparse vestiture across S2 (cf. fig. 26F) 83

83 (82). Mesoscutum shining, interspaces present and smooth; mesoventral area with long erect hairs; tibiae and tarsi light red-brown ..... *L. metallicum* sp. nov.

— Mesoscutum dull, punctures contiguous; mesoventral area with short adpressed hair; tibiae and tarsi dark brown ..... *L. asperithorax* (Cockerell)

84 (81). Metasomal S2–S4 vestiture sparse with short adpressed hair only; mesoventral area vestiture short adpressed hair only, midline deeply grooved (figs 24B, E) 85

— Metasomal S2–S4 vestiture with erect hair arranged in rows, mesoventral area vestiture either short adpressed or long erect hair, midline not deeply grooved 86

85 (84). Mesoventral area densely clothed in imbricate, short, overlaid adpressed hair overlaid (fig. 24F), two small raised ridges separated by distance equal to interocellar distance (fig. 24E); legs with femora, tibiae and tarsi red-brown, fore and mid tarsal segments flanged laterally ..... *L. pappodum* sp. nov.

— Mesoventral area with sparse cover of simple, short adpressed hair (fig. 24B), ridges absent; legs brown to dark brown, tarsal segments not flanged ..... *L. orbatum* (Smith)

86 (84). Mesoventral vestiture adpressed 87

— Mesoventral vestiture erect 97

87 (86). Metasomal vestiture sparse, not forming a pattern 88

— Metasomal vestiture forming a distinct pattern 90

88 (87). Mesoscutum dull, punctures contiguous across surface ..... *L. clelandi* (Cockerell)

— Mesoscutum mesial punctation not contiguous, interspaces polished 89

89 (88). Gonocoxite with long, stout setae on apical inner margin (fig. 141E) ..... *L. pulvitectum* (Cockerell)

— Gonocoxite glabrous on apical inner margin (fig. 98E) ..... *L. helichrysi* (Cockerell)

90 (87). Metasomal S4 hair uneven across sternite, either with lateral or mesial tufts 91

— Metasomal S4 hair even across sternite 92

91 (90). Mesoscutum dull, punctures mostly contiguous; metasomal S4–S5 with lateral hair tufts, hair absent mesially (fig. 30B) ..... *L. sculpturatum* (Cockerell)

— Mesoscutum polished, interspaces present, punctures separated by at least diameter of puncture; metasomal S4 with mesial hair tufts (fig. 28A) ..... *L. expansifrons* (Cockerell)

Key to adult males of *Lasioglossum (Chilalictus)* of Australia (continued)

92 (90). Mesoscutum black tinged with dark blue, mesial punctures separated by distance greater than diameter of puncture ..... *L. cambagei* (Cockerell)

— Mesoscutum black (some species tinged with brown), mesial punctures separated by distance equal to, or less than, diameter of puncture 93

93 (92). Dorsal surface of propodeum sculpture not extending to rim, restricted to basal half; genitalia with penis valves angular apically, S8 median process broadly truncate distally (cf. fig. 74H) 94

— Dorsal surface of propodeum sculpture extending to rim; genitalia with penis valves rounded apically, S8 median process not truncate apically (cf. fig. 67H) 95

94 (93). Gonocoxal retrorse lobes glabrous (fig. 74E) ..... *L. convexum* (Smith)

— Gonocoxal retrorse lobes setose (fig. 165E) ... *L. willsi* (Cockerell)

95 (93). Tarsi light red-brown to pale yellow; propodeal rim smooth and shining mesially ..... *L. chapmani* (Cockerell)

— Tarsi brown; propodeal rim dull or sculptured mesially 96

96 (95). Mesoscutum anterolaterally with transverse curved plicae or striae ..... *L. seminitens* (Cockerell)

— Mesoscutum anterolaterally with smooth interspaces ..... *L. victoriellum* (Cockerell)

97 (86). Dorsal surface of propodeum length greater than scutellum length 98

— Dorsal surface of propodeum length equal to less than scutellum length 99

98 (97). Mesoscutum mesially polished, punctures deeply impressed, separated by distance greater than puncture, parapsidal lines deeply impressed to form furrows; dorsal surface of propodeum rugulosostriolate; metasomal vestiture on S3–S4 of even length across sternite ..... *L. supralucens* (Cockerell)

— Mesoscutum dull, appears almost impunctate, few punctures not impressed, parapsidal lines as faint lines, not forming furrows; dorsal surface of propodeum striate; metasomal vestiture on S3–S4 forming lateral tufts ..... *L. striatum* sp. nov.

99 (98). Hind coxae densely hirsute along posterior surface ..... *L. melanopterum* (Cockerell)

— Hind coxal vestiture not densely hirsute 100

100 (99). Mesoscutum with conspicuous hair tufts across posterior margin 101

— Mesoscutum with hair sparsely arranged across posterior margin 103

101 (100). Antennal scapes, flagellum underneath, mid and hind legs with large areas of light red-brown colour ..... *L. ochrochilum* sp. nov.

— Antennal scapes, flagellum, mid and hind legs brown to black 102

102 (101). Genitalia with gonobase sides flanged basally, gonocoxite with lateral setae present, retrorse lobes with ventral flanges absent (fig. 38E) ..... *L. amplexum* sp. nov.

— Genitalia with gonobase sides parallel, gonocoxite without lateral setae, retrorse lobes with ventral flanges present (fig. 51E) ..... *L. bicolor* sp. nov.

103 (100). Mesoscutum anterior margin with mesial projection 104

— Mesoscutum anterior margin rounded 107

104 (103). Antennal flagellum length shorter than head width 105

— Antennal flagellum length longer than head width 106

105 (104). Mesoscutum, propodeal rim and metasomal T1 polished, punctures shallow, separated by at least diameter of puncture on mesoscutum mesially and along anterior margin of metasomal T1 ..... *L. bucculum* sp. nov.

— Mesoscutum, propodeal rim and metasomal T1 dull, punctures deeply impressed, separated by less than diameter of puncture on mesoscutum mesially and metasomal T1 ... *L. lanarium* (Smith)

106 (104). Metasomal S4–S5 with lateral hair tufts; dorsal surface of propodeum ruguloso-striolate, posterior rim mesially rounded ..... *L. hapsidum* sp. nov.

— Metasomal without lateral hair tufts; dorsal surface of propodeum striate, posterior rim mesially forming ridge ..... *L. repraesentans* (Smith)

107 (103). Hind tibiae red-brown to light red-brown 108

— Hind tibiae brown to black 109

108 (107). Legs light red-brown; metasomal T1–T3 red-brown; dorsal surface of propodeum striolate, rim dull .... *L. parasphecodum* sp. nov.

— Fore tibiae, mid and hind femora, tibiae and all tarsi red-brown; metasoma black; dorsal surface of propodeum ruguloso-striolate, rim smooth and polished ..... *L. dolichocerum* (Cockerell)

109 (107). Dorsal surface of propodeum sculpture extending to rim 110

— Dorsal surfaee of propodeum sculpture not extending to rim 113

110 (109). Metasomal vestiture sparse, hairs simple or minutely branched 111

— Metasomal vestiture with conspicuous rows of plumose hair across S2–S4 112

111 (110). Pygidial plate rounded ..... *L. castor* sp. nov.

— Pygidial platc bilobed ..... *L. pollux* sp. nov.

112 (110). Mesoscutum and metasomal tergites with steel blue tinge ..... *L. instabilis* (Cockerell)

— Mesoscutum and mctasomal tergites black or dark brown ..... *L. calophyllae* (Rayment)

113 (109). Mesoscutum punctures mesiad of parapsidal lines distinct, deeply impressed, separated by distance less than diameter of puncture; dorsal surface of propodeum striolatc ..... *L. subplebeium* (Cockerell)

— Mesoscutum punetures mesiad of parapsidal lines indistinct, shallow, separated by distance equal to or greater than diameter of puncture; dorsal surface of propodeum ruguloso-striolate ..... *L. occidens* sp. nov.

Lasioglossum (Chilalictus) abrophilum sp. nov.

Figures 5A–D, 32A–F

Material examined. Holotype ♀, Queensland, Sandringham Stn, 55 km NW of Bedourie (24°03′S, 139°03′E), 1979–1980, S. Morton, stony plains (ANIC, in poor condition, head, metasoma, right wing and right foreleg are detached and glued to pinned pith, right mid and hind tibiae and tarsi are lost.)

Paratypes (7♂♂). Northern Territory, 1♂, 33 km WNW of Alice Springs (23°36′S, 133°34′E), 30 Sept 1978, JCC (ANIC).

Queensland, 6♂♂, 45 km NW of Quilpie (26°28′S, 143°48′E), 9 Nov 1990, M.P. Zalucki & G.V. Maynard, on *Frankenia* & *Eremophila* (UQIC).

Diagnosis. Glossa characters unlike any other species. Glossa length greater than head width. Both sexes with head and mesosoma black, metasoma brown, proboscis variously elongated. Female with frons retieulate, mesoscutum densely punctate, dorsal surface of propodeum defined posterolaterally by carinae set well below dorsal level, fore coxae recessed for reeeption of proboscis. Male with mesosternal

area with two large, protruding medial processes; antennal flagellum short, subequal to UID. Mean measurements compared to HW: GL=1.06 (both sexes); LPL=0.68 (female), 0.62 (male); MPL=0.56 (female), 0.50 (male); PML=0.80 (female), 0.82 (male); HL=0.93 (female), 0.95 (male).

Description of female. Body length, 5.31 mm; forewing length, 1.44 mm; head width, 1.55 mm. Relative dimensions: HW 100, HL 93, UID 70, LID 60, AOD 21, IAD 12, OAD 33, IOD 22, OOD 16, CL 19, GW 24, EW 22, SL 35, FL 60.

Structure (figs 5A, B). Head elongate, 0.93 × as long as wide, inner orbits converging distinctly below, median frontal carina reaching median ocellus, anterior half of carina barely visible, eyes with few minute setae. Scape reaching two-thirds of distance to median ocellus. Clypeus short (CL 0.32 × LID), about half extending below lower level of eyes, weakly convex, shining on anterior half, basal half with minute, transversely lineolate, densely punctured mesially with oval shaped punctures, openly punctured laterally with rounded punctures. Frons elongate, minutely reticulate above antennal bases, pattern appears to be punctate but sculpture raised above general surface, sculpture weakened laterally to indistinct along inner margin of eyes, extends vertically to level of posterior margin of lateral ocelli. Labrum basal median area raised to distal basal area, surface sculpture roughened, distal process flanged, distal margin wider than base, median keel well developed, extends to distal margin, lateral ridges absent, distal margin slightly sinuate and setose, a few lateral teeth present. Proboscis variously elongated (fig. 5A), mean measurements compared to head length: GL 1.06, glossa densely hirsute; LPL 0.68; MPL 0.56; PML 0.80; MGL 0.44; PGL 0.43, paraglossae hirsute along margins. Pronotum dorsolateral angles weakly projected, bluntly obtuse. Mesoscutum narrower than head width, anterior margin with weakly bilobed mesial projection, punctation moderately coarse, along anterior margin impunctate, weakly lineolate, remainder densely punctate, punctures in parapsidal areas distinctly smaller than mesial punctures, surface dull. Scutellum length equal to dorsal surface of propodeum length, surface shining, mesially sparsely punctate, around margins and along midline densely punctate. Dorsal surface of propodeum defined posterolaterally by carinae, carinae well below dorsal surface, carinae not meeting mesially, sculpture striate, mesially weakly rugulose, sculpture on anterior half only, remainder smooth with dorsal surface gently curved laterally and posteriorly, posterovertical carinae weakly present, extending to dorsal carinae. T1 densely punctate, punctures minute. Mesepisternum and metepisternum with several longitudinal striae. BP rounded; fore coxae reduced, not meeting along midline, rotated to obtuse angle along long axis of body; first recurrent vein enters second submarginal cell well short of first cubital vein.

Colour. Head black except ventral half of clypeus and antennal scapes brown, flagellar segments light brown, mesosoma black, metasoma brown suffused with dark brown on basal half of each tergite; legs light brown.

Vestiture. Head with some minutely branched, adpressed hair in lower paraocular areas, a few sparse simple and minutely branched, erect hairs on frons; mesoscutum with sparse cover of small, erect, simple hair, few long hairs on mesepisternum and dorsolateral margins of propodeum, weak lateral tomentum on T2, across T3 and T4.

Description of male. Body length 4.08–4.47 mm ($\bar{x}$=4.31 mm, SD=0.13, n=7), head width 1.25–1.37 mm (n=10), forewing length 1.01–1.10 mm ($\bar{x}$=1.07 mm, SD=0.03, n=7). Relative dimensions: HW 100, HL 95–96, UID 70–71, LID 49–52, AOD 18–19, IAD 13–14, OAD 32–34, IOD 23–25, OOD 18–19, CL 20–21, GW 20–21, EW 27–28, ML 40–41, SL 27–28, FL 73–74.

Structure (figs 5C, D). Head elongate as in female; eyes converging below; sculpture similar to female except weaker; labrum with defined basal area, small rounded distal process; malar space absent; proboscis variously elongated (fig. 5C), mean measurements compared to head length: GL 1.06, glossa densely hirsute; MPL 0.50; LPL 0.62; PML 0.82; PGL 0.35. Antennae short, flagellum 1.06 × UID, flagellar segments wider than long, AS4:AS2+3=0.4. Remainder of body similar to female except: mesoscutum openly to closely punctate, interspaces shining; scutellum almost impunctate, few weak, sparsely separated shallow punctures; dorsal surface of propodeum not defined by carinae, dorsal rim shining; mesoventral area with two large, rounded processes (fig. 32F) projecting at 90° to long axis of body, length equal to diameter of median ocellus, deep trough formed between two parallel processes; colour similar to female except ventral margin of clypeus ochroleucus, metasoma dark brown, pygidial plate red-

brown; legs as in female; forewings with 2nd r-m distinctly weaker than 1st r-m.

Vestiture. Head with dense cover of short, minutely branched adpressed hair, few long, erect, minutely branched hairs on lateral pronotum, mesoscutum and lateral pleura, remainder of mesoscutum with short, simple hair, weak lateral tomentum on T2 and T3; sternal vestiture sparse, a few, ereet, simple or minutely branched hairs across anterior margin of each sternite.

Genitalia and associated sterna. (figs 32B–E). Gonobase sides weakly flanged basally, gonocoxite setose on apieal inner margin, gonostyli long, upper margin glabrous, underneath margin sparsely setose with simple and weakly branched setae and several stout spine-like setae, retrorse lobes setose, well developed, ventral flanges present; S8 and S7 median processes elongate and rounded, S8 with simple setae distally, S7 glabrous.

Distribution (fig. 32A). Southwestern Queensland and southern Northern Territory.

Etymology. The epithet *abrophilum* means "dry loving" and refers to the species' habitat.

Floral Forage Record. Family visited and Cateh total = 1, Frankeniaccae (1 catch). Genus visited, *Frankenia* (1).

Flight Phenology.

0	0	0	0	0	0	0	0	1	0	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Both sexes of *L. abrophilum* have an unusually elongated glossa. Although *Frankenia* and *Eremophila* are listed as plants on which the speeimens were colleeted, I suggest that *Frankenia* is the correet and sole food plant (supported by G. Maynard, personal communication, who remembers "the small brown halietine bees were colleeted on the *Frankenia*"). Apparently, there was a *Frankenia* plant at the base of the *Eremophila* plant. *Lasioglossum frankenia*, a presumed monolectie feeder on *Frankenia*, also possesses unusually elongate mouthparts, although in this speeies the prementum has been markedly elongated rather than the glossa. (See *Remarks* on *L. frankenia*.)

Lasioglossum (Chilalictus) adustum sp. nov.

Figures 26E, 33A–H

Material examined. Holotype, ♀, Western Australia, 19 km SSW of Grass Patch, (33°23′S, 121°40′E), 19–20 Sep 1981, IDN & JCC (ANIC).

Paratypes (41♀♀, 12♂♂). Queensland: 1♂, 40 mi (64 km) E of Charleville (26°24′S, 146°35′E), 31 Oct 1971, EME, on *Eucalyptus* (UQIC); 4♀♀, 10 mi (16 km) W of Charleville (26°24′S, 146°10′E), 1 Nov 1971, EME, on *Eucalyptus* (UQIC); 2♀♀, 20 mi (32 km) W of Charleville (26°24′S, 146°04′E), 1 Nov 1971, EME, on *Eucalyptus* (UQIC); 3♂♂, Morven (26°25′S, 147°07′E), 3 Nov 1971, EME, on *Eucalyptus* (UQIC); 1♀, 10 mi (16 km) SW of Charleville (26°28′S, 146°11′E), 15 Apr 1969, TFH, on *Eremophila gilesii* (UQIC); 1♀, 9 km W of St George (28°03′S, 148°30′E), 19 Dec 1976, EME & T. Low, on *Eucalyptus intertexta* (UQIC).

New South Wales: 1♂, 34 km SW of Bourke (30°13′S, 145°48′E), 14 Dec 1976, EME & T. Low, on *Eucalyptus largiflorens* (UQIC); 1♂, 23 km SE of Cobar (31°31′S, 146°06′E), 3 Dec 1981, JCC (ANIC); 1♂, Broken Hill (31°58′S, 141°27′E), 29 Oct 1983, KLW, on *Eucalyptus* (NMV T-15330); 3♀♀, 63 km E of Mildura (34°11′S, 142°41′E), 30 Feb 1983, KLW, on *Eucalyptus* (NMV T-15331–15333).

Victoria: 1♂, 19 km S of Murrayville (35°26′S, 141°11′E), 10–11 Mar 1977, C.A. & TFH, on *Eucalyptus* (SAM).

South Australia: 1♀, Bolla Bollana, Arkaroola (30°19′S, 139°20′E), 26 Aug 1969, EME, on *Zygophyllum apiculatum* (UQIC); 1♂, 70 km E of Copley (30°33′S, 138°59′E), 27 Oct 1990, KLW, on *Eucalyptus* (NMV T-15334); 7♀♀, 28 km NE of Wirrulla (32°14′S, 134°39′E), 7 Mar 1976, C.A. & TFH, on *Eucalyptus* (SAM); 1♀, Lake Gilles Nat. Pk (32°56′S, 136°46′E), 7 Oct 1974, C.A. & TFH, on *Acacia sowdenii* (SAM); 6♀♀, N. Middleback Range (33°03′S, 137°09′E), 7–8 Oct 1973, C.A. & TFH, on *Eremophila alternifolia* (SAM).

Western Australia: 1♂, Boulder (30°47′S, 121°29′E), 3 Feb 1973, EME, on *Eucalyptus* (UQIC); 1♀, 14 mi (22 km) W of Coolgardie (30°57′S, 121°02′E), 28 Jan 1973, EME, on *Eucalyptus salubris* (UQIC); 4♀♀, 4–14 mi (6–22 km) W of Coolgardie (30°57′S, 121°02′E), 4 Feb 1973, EME & T. Low, on *Eucalyptus clelandi* (UQIC); 1♀, 40 mi (64 km) W of Coolgardie (30°57′S, 120°49′E), 18 Jan 1970, TFH, on *Eucalyptus* (SAM); 1♂, 90 km N of Norseman (31°27′S, 121°47′E), 20 Nov 1989, KLW, on *Melaleuca* (NMV T-15335); 4♀♀, 35 km E of Norseman (32°12′S, 122°04′E), 30 Oct 1989, KLW, on *Eremophila* (NMV T-15336–15339); 1♀ (32°14′S, 122°18′E), 40mi (64 km) E of Norseman, 10 Jan 1970, TFH, on *Eucarya* (SAM); 1♀, King Rocks, 31 km NE of Hyden (32°19′S, 119°10′E), 11 Jan 1986, G. & A. Daniels, at mv light (UQIC); 1♂, 70–75 km ENE of Norseman (32°20′S, 121°54′E), 10–16 Nov 1978, TFH et al, on flowers of *Eremophila scoparia* (WAM 87/67); 1♀, 70–75 km ENE of Norseman (32°20′S, 121°54′E), 10–16 Nov 1978, TFH et al, on flowers of *Myoporum* (WAM 87/65); 2♀♀, same data as holotype (ANIC).

Other speeimens examined (58♀♀, 29♂♂). Queensland: Mt Isa.

New South Wales: Kinchega Nat. Pk.

South Australia: Quorn, Uro Bluff, Andamooka HS.

Northern Territory: Erldunda, Alice Springs; Glen Helen.

Western Australia: Katanning, York, Meckering, Coolgardie, Coolgardie, Kalgoorlie, Bullfinch, Wan-

noo, Carnarvon, Great Northern Hwy, Newman Turnoff, Onslow, Newman, Millstream.

Diagnosis. Like *L. ochroma* though general body colour markings different. Female with head and mesoscutum dark brown tinged with black, metasoma light red-brown, basal two-thirds of clypeus light red-brown, legs with coxae yellow, remainder light yellow red-brown, frons striate, mesoscutum with a dull sheen, openly to closely punctate, dorsal surface of propodeum rugulosostriolate, defined by posterolateral carinae. Male with Head and mesoscutum dark brown, metasoma red-brown, mandibles, antennae moderately long (FL 2.36 × UID), AS4=AS2+3, S3–S4 each with tufts on either side of midline though midline bare, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.31–5.00 mm ($\bar{x}$=4.61 mm, SD=0.22, n=10), head width 1.34–1.39 mm (n=10), forewing length 1.27–1.34 mm ($\bar{x}$=1.30 mm, SD=0.03, n=10). Relative dimensions: HW 100, HL 82–84, UID 61–62, LID 54–55, AOD 18–19, IAD 11–12, OAD 31–32, IOD 22–23, OOD 12–13, CL 19–20, GW 18–19, EW 28–29, SL 37–39, FL 81–83.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, upper half weak, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.36 × LID), convex, more so along ventral margin and laterally, anterior two-thirds smooth and shining, remainder dull covered with fine reticulate pattern, closely punctate mesially with deeply impressed punctures, laterally sparsely punctate with slightly smaller punctures, posterior margin openly punctate with small, rounded, shallow punctures, supraclypeal area raised, surface shining, openly punctate with small, shallow punctures. Frons (fig. 33A) striate above antennal bases, sculpture weakens laterally to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 33B) median basal area raised to form V-shaped tubercle, anterior margin rounded, margin raised forming lip, distal process triangular, widest at base, median keel broad, extends beyond distal margin, lateral ridges broad, recurved towards median keel processes, setae not present across distal margin, lateral teeth absent. Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 33C) anterior margin rounded, punctation fine, surface with a dull sheen, covered with fine reticulate pattern, anteriorly impunctate, mesially and in parapsidal areas openly to closely punctate with small, shallow, rounded punctures. Scutellum length equal to dorsal surface of propodeum, surface polished, impunctate, except midline dull with finely striate pattern, openly punctate with minute punctures. Dorsal surface of propodeum (fig. 33C) defined by posterolateral angular carinae set well below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate with a few striae laterally, sculpture not reaching dorsal rim, rim with a dull sheen. T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum smooth to minutely roughened, surface shining. BP rounded.

Colour. Head and mesoscutum dark brown tinged with black, metasoma light red-brown, basal two-thirds of clypeus light red-brown, remainder brown, antennae light brown, pronotum lateral margins and legs with coxae yellow, remainder yellow tinged with light red-brown.

Vestiture. Lower frons, paraocular areas and genae with dense cover of short, adpressed, minutely plumose hair, hair in paraocular area and genae forming a mat, mesoscutum with tomentum along lateral and posterior margins, mesially with short hair laterally directed, metasomal tomentum absent.

Description of male. Body length 3.62–4.24 mm ($\bar{x}$=3.90 mm, SD=0.21, n=10), head width 1.22–1.27 mm (n=10), forewing length 0.99–1.13 mm ($\bar{x}$=1.08 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 83–84, UID 60–61, LID 45–47, AOD 14–15, IAD 12–13, OAD 28–29, IOD 24–25, OOD 14–15, CL 19–20, GW 16–18, EW 30–32, ML 38–40, SL 36–38, FL 142–145.

Structure. Head triangular, inner orbits converging below, median carina reaches median ocellus, clypeus weakly concave mesially, surface shining, appears impunctate though with a few minute punctures mesially, anterior two-thirds bright yellow, supraclypeal area flat, shining impunctate. Antennae moderately long (FL 2.36 × UID), AS4=AS2+3. Remainder as in female, frons striate, median frontal carina reaches median ocellus, pronotum dorsolateral angles rounded, not projected, mesoscutum smooth and highly polished, sparsely punctate with minute punctures, scutellum highly polished, impunctate, dorsal surface of propodeum not defined by carinae, dorsal sculpture rugulose on basal half of dorsal surface only, dorsal rim

smooth and shining, head and mesoscutum dark brown, metasoma red-brown, mandibles and clypeus as noted bright yellow, antennal scapes and flagellum light yellow-brown, legs yellow tinged with light red-brown, forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower frons, paraocular areas and genae with dense cover of short, adpressed hair forming a mat, clypeus glabrous, mesoscutum almost glabrous, with a few sparse hairs, metasomal tomentum absent, S2 with median tuft of hair, S3 and S4 each with tufts on either side of midline though midline bare and tufts not reaching lateral margin of sterna, S5 and S6 with short, sparse hair (fig. 26E).

Genitalia and associated sterna (figs 33E–H). Gonobase sides slightly flanged basally, gonocoxite without setae, gonostyli long, with dense cover of erect, branched hair, retrorse lobes setose, well developed, ventral flanges absent, S8 median process elongate, narrow, rounded and setose apically, S7 rounded and glabrous apically.

Distribution (fig. 33D). Eyrean province.

Etymology. The epithet *adustum* means "tanned brown" and refers to the colour on the head and mesoscutum.

Floral Forage Record. Families visited=9. Catch total=49; Capparidaceae (1 catch), Chenopodiaceae (1), Fabaceae (3), Myoporaceae (7), Myrtaceae (32), Proteaceae (2), Santalaceae (1), Sapindaceae (1), Zygophyllaceae (1). Genera visited=11; *Acacia* Mill. (3), *Atalaya* Blume (1), *Capparis* L. (1), *Eremophila* (6), *Eucalyptus* L' Hérit (31), *Eucarya* T.L. Mitch. (1), *Hakea* Schraud (2), *Melaleuca* L. (1), *Myoporum* Banks & Solander ex Forst.f. (1), *Salsola* L. (1), *Zygophyllum* L. (1).

Flight Phenology.

11	7	2	2	0	1	0	4	3	11	8	7
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum adustum may represent a species-complex. Two colour morphs, with intermediates, occur with variation restricted to the fore coxae. Females with yellow fore coxae usually have a light red-brown clypeus, although the clypeus on several is black. Females with brown fore coxae usually have a black clypeus, although the clypeus on several is light brown on the basal third. Male colour patterns are similar to those of the female except that the clypeus is always bright yellow. Specimens with yellow fore coxae occur in only the southern half of the Eyrean province while specimens with brown fore coxae co-occur in this area and also occur in the northern half of the Eyrean zone. At present, the two morphs are considered conspecific on the basis of similar male genital characters.

The paratype series includes only specimens with yellow fore coxae and a light red-brown clypeus. Specimens listed in "Other Specimens examined" have brown fore coxae and variable clypeal colour. Several males showed macrocephalic development.

Lasioglossum (Chilalictus) alacarinatum sp. nov.

Figures 34A–I

Material examined. Holotype. ♀, South Australia, 22 km W of William Creek (28°55′S, 136°10′E), 30 Oct 1990, KLW, on *Hakea* (NMV T-15340).

Paratypes (23♀♀, 2♂♂). South Australia: 1♀, 1♂, 41 mi (66 km) W of Amata (Musgrave Pk) (26°09′S, 130°49′E), 23 Oct 1972, H.E. Evans & TFH, on *Acacia* (SAM); 7♀♀, 1♂, 7 km S of Emu (28°37′S, 132°11′E), 7 Oct 1976, C.A. & TFH & J. Herridge, on *Rutidosis helichrysoides* (SAM); 1♀, same data as holotype (NMV T-15341); 1♀, 50 km NNE of Roxby Downs (30°17′S, 136°49′E), 31 Oct 1990, KLW, on *Hakea* (NMV T-15342); 9♀♀, 25 km NNE of Roxby Downs (30°29′S, 136°48′E), 31 Oct 1990, KLW, on *Helichrysum* (NMV T-15343–15351); 1♀, 20 km NNE of Roxby Downs (30°28′S, 136°49′E), 31 Oct 1990, KLW, on *Helichrysum* (NMV T-15352); 3♀♀, 10 km NNE of Roxby Downs (30°37′S, 136°47′E), 31 Oct 1990, KLW, on *Hakea* (NMV T-15353–15355).

Other specimens examined (23♀♀, 1♂). Queensland: Dynevor Lakes.

New South Wales: Quandong.

South Australia: Birdsville Track crossing at Coopers Creek, Emu Junction, Myrtle Springs.

Northern Territory: Alice Springs, Aneri Well, Mt Conner.

Western Australia: Lake Throssell.

Diagnosis. Most like *L. cephalochilum* and *L. carpobrotum*, differs from both species with mesoventral vestiture branched on both sides of the hair shaft and lateral hair tufts on T1. Unlike any other species in shape of distal end of labrum median keel. Both sexes with head and mesosoma black, metasoma brown with banded appearance in female only. Female with frons punctate, mesoscutum densely punctate, dorsal surface of propodeum weakly striolate, not defined by carinae, body conspicuously hirsute, T1 with mesolateral hair tufts. Male with antennae conspicuously short (FL 0.98 × UID), AS4:AS2+3=0.3, T1 with mesolateral hair tufts, sterna almost bare, S5 with crescent shape

hair pattern, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 3.93–4.77 mm ($\bar{x}$=4.51 mm, SD=0.26, n=10), head width 1.43–1.57 mm (n=10), forewing length 1.06–1.34 mm ($\bar{x}$=1.15 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 77–79, UID 68–69, LID 53–54, AOD 19–21, IAD 12–13, OAD 30–31, IOD 21–22, OOD 18–19, CL 18–20, GW 13–15, EW 27–28, SL 31–32, FL 58–60.

Structure. Head broad, appears convex in side view, frons, paraocular areas, supraclypeal area and clypeus confluent, all continue contours from vertex to ventral margin of clypeus, inner orbits converging below, median frontal carina almost reaches median ocellus, eyes with sparse cover of minute setae. Scape not reaching anterior margin of median ocellus. Clypeus short (CL 0.37 × LID), convex, more so ventrally, surface shining, along anterior margin a few large, deeply impressed punctures, posteriorly densely punctate with small, rounded punctures, supraclypeal area shining, densely punctate. Frons (fig. 34A) punctate above antennal bases, punctures impressed, not forming striae, sculpture laterally punctate along inner orbits, extends vertically to at least posterior margin of lateral ocelli. Labrum (fig. 34B) median basal area raised, weakly nodulated, anterior margin rounded mesially, distal process not widest at base, weakly flanged distally, medial keel broadly spatulate distally, extends to distal margin, lateral ridges absent, setae not present across margin, distal setae originate submarginally, lateral teeth absent. Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 34C) anterior margin square, appears truncate, punctation moderately coarse, surface with a dull sheen, anteriorly impunctate, along midline and parapsidal areas densely punctate, mesially closely to densely punctate. Scutellum 1.3 × longer than dorsal surface of propodeum, surface shining to polished, sparsely punctate except densely punctate along midline. Dorsal surface of propodeum (fig. 34C) not defined by carinae, posterovertical surface polished, carinae not extending halfway to dorsal level, dorsal sculpture weakly striolate with a few interconnectives, striate laterally, sculpture not reaching rim, dorsal rim rounded, smooth, highly polished. T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum upper portion finely striate, lower portion smooth and polished, mesoventral area smooth and shining. BP broadly rounded.

Colour. Head and mesosoma black, metasoma brown with posterior marginal areas of tergites light brown (banded appearance), ventral margin of clypeus and antennal flagellum light red-brown, legs brown except basal and apical ends of tibiae and all tarsi light red-brown.

Vestiture. Body conspicuously hirsute, face except ventral margin of clypeus with dense cover of short, adpressed, plumose hair forming a mat, mesoscutum with moderate cover of semi-adpressed hair, slightly denser around margin, mesoventral vestiture with minutely branched hair, metanotum with dense hair band, lateral margins of propodeum with tuft of long hair, T1 with mesolateral hair tufts, in some specimens lateral almost join mesially, metasomal tomentum across T2–T5.

Description of male. Body length 3.70–4.00 mm ($\bar{x}$=3.82 mm, SD=0.16, n=3), head width 1.32–1.41 mm (n=3), forewing length 0.94–0.99 mm ($\bar{x}$=0.96 mm, SD=0.03, n=3). Relative dimensions: HW 100, HL 80–82, UID 67–68, LID 48–50, AOD 16–17, IAD 14–15, OAD 30–31, IOD 20–21, OOD 22–23, CL 18–20, GW 14–16, EW 29–30, ML 323–24, SL 26–27, FL 66–67.

Structure. Head broad, as in female, face in side view slightly convex with confluent contours, eyes converging below, appear bare but with a few minute setae, scape reaching halfway to median ocellus, clypeus shining, punctation similar to female, with pale yellow marking on basal third, remainder of face similar to female. Antennae conspicuously short (FL 0.98 × UID), AS4:AS2+3=0.3. Remainder of body similar to female except mesoscutum polished, openly punctate, scutellum highly polished, almost impunctate, a few punctures along posterior margin, dorsal propodeum sculpture weakly ruguloso-striolate mesially, colour similar to female except metasoma dark brown to black with posterior marginal areas brown, forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body conspicuously hirsute above, sparse underneath, face with adpressed, white plumose hair forming a mat, some long hairs on base of scape and lateral pronotum, mesoscutum with adpressed and semi-adpressed plumose hair, mesial hair directed laterally, parapsidal areas hair directed mesially, mesoventral hair sparse, T1 with mesolateral hair tufts, metasomal tomentum across T2, laterally on T3–T5, sterna almost bare, S2–S4 with a few short, min-

utely branched hairs, S5 with short, adpressed, simple hair in crescent pattern on either side of midline, S6 glabrous.

Genitalia and associated sterna (figs 34E–I). Gonobase sides slightly narrowed basally, gonocoxite without setae, dorsal surface striate, gonostyli grossly enlarged apically, curved above gonocoxite appearing as a shield (fig. 34H), gonostyli with sparse cover of minute setae, retrorse lobes setose on ventral portion only, well developed, ventral flanges present and glabrous, penis valve basally expanded on outer margin only, S8 apically rounded with moderate cover of setae, S7 median process rounded, glabrous.

Distribution (fig. 34D). Central Australia.

Etymology. The epithet *alacarinatum* means "with a winged keel" and refers to the shape of the median keel on the labrum.

Floral Forage Record. Families visited=6. Catch total=13; Campanulaceae (1 catch), Compositae (6), Fabaceae (1), Myoporaceae (1), Portulacaceae (1), Proteaceae (3). Genera visited=9; *Acacia* (1), *Calandrinia* Kunth. (1), *Craspedia* Forst.f. (1), *Eremophila* (1), *Hakea* (3), *Helichrysum* Mill. corr. Pers. (3), *Myriocephalus* Benth. (1), *Rutidosis* DC. (1), *Wahlenbergia* R.Br. ex Schrad. ex Roth. (1).

Flight Phenology.

0	0	1	0	0	0	0	0	4	8	2	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum alacarinatum is one of the few black, non-metallic species which is restricted to central Australia. Although dark coloured, the body has a conspicuous white pubescence (see *Remarks* for *L. albopilosum*).

Lasioglossum (Chilalictus) albopilosum sp. nov.

Figures 16D, 35A–H

Material examined. Holotype. ♀, South Australia, 30 km SE of Pimba (31°23′S, 136°56′E), 2 Nov 1990, KLW, on *Hakea* (NMV T-15356).

Paratypes (15♀♀, 15♂♂). Queensland: 1♂, 62 km SW of Boulia (23°02′S, 139°18′E), 16 Oct 1978, JCC (ANIC); 3♀♀, 30 mi W Windorah (25°25′S, 142°24′E), 10 Aug 1969, EME, on green flower (UQIC).

South Australia: 1♀, 2♂♂, 6 km WSW of Purni Bore (26°17′S, 136°06′E), 22 Apr 1977, TFH, in sleeping cluster of *Nomia ?flavoviridis* males (SAM); 2♀♀, Antikootirrimna W/H, 36 km S, of Abminga (26°26′S, 134°51′E), 25 Sep 1972, Z. Leipa (ANIC); 1♀, Coongie Lakes (27°11′S, 140°10′E), 15 Mar 1990, J. Puckridge, on *Portulacea oleraceae* (NMV T-15357); 1♀, Mungeranie Bore, 67.6 km N of Coopers Creek, B/ville Track (28°02′S, 138°41′E), 17 Sep 1972, Z. Leipa (ANIC); 3♀♀, 1♂, same data as holotype (NMV; ♀♀ T-15358–15360, ♂ T-15361); 1♀, Martins Well, 90 km NE of Hawker (31°29′S, 139°07′E), 26 Oct 1990, KLW, on *Eremophila* (NMV T-15362).

Northern Territory: 1♂, Alice Springs (23°42′S, 133°52′E), 6 Nov 1988, Stop T-7, D.C. Rentz, yellow pan trap (ANIC); 1♀, Finke River (23°55′S, 132°43′E), J.W. Rose (SAM); 1♂, 30 km S of Alice Springs (24°12′S, 133°52′E), 3 Nov 1974, EME & R.I. Storey, on *Eucalyptus gammophylla* (UQIC); 1♂, 21 km NNE of Andado HS, Simpson Desert (25°15′S, 135°19′E), 28 Sep 1972, Z. Leipa (ANIC); 1♂, Mt Olga (25°17′S, 130°42′E), 6 May 1978, JCC (ANIC); 1♂, Aneri Well, Mt Conner (25°32′S, 131°51′E), on flowers, 20 Oct 1975, R.H. Besserdin (NMV T-15363); 2♀♀, 6♂♂, 47 km WSW of Finke (25°35′S, 134°12′E), 1 Oct 1972, Z. Leipa (ANIC).

Diagnosis. Most like *L. ochrochilum* differs by tomentum extending across T1. Both sexes head and mesosoma black, metasoma light red-brown, body with somewhat white appearance due to conspicuous amounts of white hair. Female with frons punctate, mesoscutum densely punctate, dorsal surface of propodeum ruguloso-striolate, not defined by carinae, frons, paraocular arcas, mesoscutum and metanotum with dense mats of hair, anterior half of T1 with dense hair band across entire dorsal surface. Male with antennae moderately short (FL 1.6 × UID), AS4:AS2+3=0.7, body conspicuously hirsute as in female with mesoventral area forming a mat, S2–S4 with long, plumose hair posteriorly directed, forewings with 2nd r-m as strong as 1st r-m.

mm ($\bar{x}$=6.07 mm, SD=0.27, n=10), head width 1.65–1.83 mm (n=10), forewing length 1.43–1.62 mm ($\bar{x}$=1.52 mm, SD=0.06, n=10). Relative dimensions: HW 100, HL 92–93, UID 61–63, LID 53–54, AOD 19–20, IAD 10–11, OAD 29–30, IOD 21–22, OOD 15–16, CL 22–23, GW 17–18, EW 24–25, SL 41–42, FL 71–72.

Structure. Head elongate, distinctly triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.43 × LID), convex, shining over entire surface, sparsely punctate with small, rounded punctures, supraclypeal area weakly projected, shining, closely to densely punctate. Frons (fig. 35A) punctate above antennal bases, sculpture weakens laterally to almost smooth, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 35B) median basal area

raised, almost smooth, a few weak ridges anteriorly, anterior margin rounded to bluntly obtuse mesially, margin slightly raised forming lip, more so laterally, distal process triangular, widest at base, median keel extends to distal margin, lateral ridges weak, setae present across margin, lateral teeth absent. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 35C) anterior margin with rounded mesial projection, punctation moderately coarse, surface shining, anteriorly impunctate, along midline and parapsidal arcas densely punctate, mesially closely to densely punctate. Scutellum 1.3 × longer than dorsal surface of propodeum, shining, sparsely punctate except closely punctate along midline. Dorsal surface of propodeum (fig. 35C) not defined by carinae, posterovertical carinae extend less than halfway to dorsal level, dorsal sculpture ruguloso-striolate with a few striae laterally, sculpture just short of dorsal rim, rim rounded, with a dull sheen. T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum finely striate. BP rounded.

Colour. Head and mesosoma black, metasoma red-brown, clypeus light red-brown on basal half, antennal flagellum light brown underneath, tibiae, tarsi and apical portion of femora light red-brown, remainder dark brown to black, some specimens (including holotype) with T1 darkened on anterior half.

Vestiture. Body distinctly hirsute, frons and paraocular areas with short, adpressed, plumose hair forming a mat, clypeus and supraclypeal area with small amounts of similar hair on margins, mesoscutum with adpressed, plumose hair over much of surface, margins, especially posterior margin with dense mat of hair, metanotum with dense mat of hair, anterior half of T1 with dense hair band across entire dorsal surface (fig. 16D), broad tomentum bands across entire tergites on T2–T5.

Description of male. Body length 5.24–5.78 mm ($\bar{x}$=5.45 mm, SD=0.19, n=10), head width 1.53–1.72 mm (n=10), forewing length 1.36–1.48 mm ($\bar{x}$=1.43 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 90–92, UID 65–67, LID 39–43, AOD 18–19, IAD 12–13, OAD 28–29, IOD 22–24, OOD 17–18, CL 21–22, GW 17–18, EW 29–30, ML 38–40, SL 29–30, FL 103–105.

Structure. Head elongate, inner orbits converging below, eyes with a sparse cover of minute setae, scape not reaching median ocellus, clypeus convex, shining, appears impunctate, basal half with pale yellow marking, remainder dark brown to black, supraclypeal area weakly projected, shining, densely punctate. Antennae moderately short (FL 1.6 × UID), AS4: AS2+3=0.7. Remainder of body similar to female except dorsolateral angles almost absent, mesoscutum punctation openly to closely punctate, scutellum polished, almost impunctate, dorsal surface of propodeum sculpture similar except dorsal rim polished, colour similar to female except metasoma with banded appearance, anterior half of tergites dark brown, posterior half light brown, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body conspicuously hirsute, entire face except basal half of clypeus densely covered with short, white, adpressed, plumose hair forming a mat, genae with long hair, not forming a beard, mesoscutum with conspicuous cover of adpressed, plumose hair, not forming a mat, metanotum with tomentum, anterior half of T1 with broad hair band across entire tergite, tomentum across T2–T5, mesoventral area with short, adpressed setae forming a mat, S2–S4 with dense, long, white, plumose hair posteriorly directed, S5 with short, adpressed hair, S6 almost glabrous.

Genitalia and associated sterna (figs 35E–H). Gonobase sides flanged basally, gonocoxite setose on upper inner margin, gonostyli long with weakly branched setae, retrorse lobes setose, well developed, ventral flanges absent, penis valves flanged on apical inner margin and outer basal margin, dorsal inner margin with median area of minute spicules, S8 median process elongate, apically rounded with several branched setae, S7 median process rounded, glabrous.

Distribution (fig. 35D). Central Australia.

Floral Forage Record. Families visited=5. Catch total=5; Fabaceae (1 catch), Myoporaceae (1), Myrtaceae (1), Portulacaceae (1), Proteaceae (1). Genera visited=5; *Acacia* (1), *Eremophila* (1), *Eucalyptus* (1), *Hakea* (1), *Portulaca* L. (1).

Etymology. The epithet *albopilosum* means "white hair" and refers to the vestiture across T1.

Flight Phenology.

0	0	1	1	1	0	0	1	3	3	3	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Although the head and metasoma of *L. albopilosum* are black, the morphological

character set is that usually associated with metallic species. Several darkly pigmented species, that occur exclusively in the arid zone, possess a white pubescence (e.g. *L. alacarinatum*). This may be an adaptation to the heat as the white pubescence would reflect much of the light compared to the dark colours which would absorb the heat.

Lasioglossum albopilosum is one of three species, all of which are restricted to the desert region, in which both sexes possess a tomentum across the surface of T1. One male specimen showed slight macrocephaly with an increase in the lower interorbital distance and genal width. The male mesoventral vestiture is unusual, consisting of short, plumose hairs that densely cover the area. Only males of *L. pappodum* have a similar appearance, although examination of the hair structure revealed marked differences. On *L. albopilosum*, the hair consists of a central shaft along which numerous branches occur, on *L. pappodum* each hair has no visibly defined central shaft but broaden apically due to a series of short, thickened serrate projections.

Lasioglossum (Chilalictus) alpinum sp. nov.

Figures 22C, 36A–E

Material examined. Holotype ♂. Victoria, Dinner Plain, 11 km from Hotham Heights (37°02′S, 147°14′E), 27 Feb 1980, IDN & JCC (ANIC, missing distal three antennal flagellar segments).

Paratypes. 2♂♂, same data as holotype (ANIC).

Diagnosis. Unlike any other species in which the male possesses mesoventral processes. Male with body black, antennae moderately long (FL 1.98 × UID), AS4:AS2+3=1, mesoventral area with two large, juxtaposed, posteriorly directed processes curved apically towards midline, S2–S4 with long, posteriorly directed, plumose hair, forewings with 2nd r-m weaker than 1st r-m.

Description of male (female unknown). Body length 4.62–4.93 mm ($\bar{x}$=4.77 mm, SD=0.16, n=3), head width 1.44–1.65 mm (n=3), forewing length 1.36–1.48 mm ($\bar{x}$=1.42 mm, SD=0.06, n=3). Relative dimensions: HW 100, HL 90–92, UID 68–70, LID 48–50, AOD 16–17, IAD 14–15, OAD 27–28, IOD 21–22, OOD 20–21, CL 20–21, GW 18–20, EW 27–28, ML 38–40, SL 25–26, FL 138–139.

Structure. Head broad though distinctly triangular, inner orbits converging below, median frontal carina well developed, reaches median ocellus, eyes with a sparse cover of minute setae. Antennae moderately long (FL 1.98 × UID), AS4:AS2+3=1. Scape well short of reaching median ocellus. Clypeus weakly convex, surface shining, except dull along anterior margin, impunctate except indistinct shallow depressions anteriorly, basal half pale yellow, supraclypeal area slightly raised mesially, shining, impunctate. Frons coarsely striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum anterior margin rounded, surface with a dull sheen as covered with fine reticulate pattern, anteriorly impunctate, mesially openly to closely punctate, parapsidal areas closely to densely punctate, mesoventral area with two large, juxtaposed processes separated by less than half IAD, processes posteriorly directed and curved apically towards midline (fig. 22C). Scutellum 1.3 × longer than dorsal surface of propodeum, surface with a dull sheen, sparsely to openly punctate. Dorsal surface of propodeum not defined by carinae, posterovertical carinae not extending halfway to dorsal level, dorsal sculpture ruguloso-striolate, almost reaching dorsal rim in holotype, reaching halfway to rim in paratype, dull rim, rounded to vertical surface. T1 densely punctate except impunctate along posterior marginal area. Mesepisternum and metepisternum dull, surface minutely roughened with a few striae on upper portion. Forewings with 2nd r-m weaker than 1st r-m, BP narrowly rounded.

Colour. Body black except clypeus as noted, mandibles red-brown apically, posterior marginal areas of tergites and legs brown.

Vestiture. Frons with erect, simple and weakly branched hair, lower paraocular areas with some adpressed, plumose hair not forming a mat, mesoscutum with erect, minutely branched hair, mesepisternum with long, branched hair, weak metasomal tomentum laterally on T2 and T3, S2–S4 with long, semi-adpressed, posteriorly directed, plumose hair across sternites, S5 and S6 with simple, adpressed hair.

Genitalia and associated sterna (figs 36B–E). Gonobase sides parallel, gonocoxite without setae, gonostyli long, apically enlarged, with dense cover of long branched hair on upper surface, retrorse lobes setose, moderately well developed, ventral flanges absent, S8 median process elongate, apically rounded and setose, S7 median process short, apically rounded, glabrous.

Distribution (fig. 36A). Above the snow line, in the Victorian alps.

Etymology. The epithet *alpinum* means "of high mountains" and refers to the high altitude locality of this species.

Floral Forage Record. None available.

Flight Phenology.

0	1	0	0	0	0	0	0	0	0	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The shape of the mesoventral area processes on *L. alpinum* is a unique example of processes that are apically curved towards the midline.

Lasioglossum (Chilalictus) amboquestrum sp. nov.

Figures 12E, 37A–D

Material examined. Holotype. ♀, Western Australia, William Bay, W of Denmark (35°02′S, 117°12′E), 10 Oct 1970, D.H. Colless (ANIC).

Paratypes (8♀♀). Western Australia: 5♀♀, Rottnest (32°00′S, 115°30′E), WAM 38-2608, 38-2609 (missing distal 2 flagellar segments of right antenna), 33-2654, 33-2655 (missing left antenna), 33-2661; 1♀, 5 km W of Lake Cave (34°05′S, 115°02′E), 7–8 Nov 1963, J. Sedlacek (BISHOP); 1♀, Denmark (34°58′S, 117°21′E), Oct 1929, T.G. WAM 30-140; 1♀ Denmark (34°58′S, 117°21′E), (ANIC, gold coated).

Diagnosis. Most like *L. athrix*, but lacks posterolateral carinae on the propodeum. Female with body black, frons coarsely striate, labrum medial keel spatulate distally, mesoscutum anterior margin with weakly bilobed mesial projection, surface moderately coarse, dorsal surface of propodeum not defined by carinae, minutely alveolate, posteriorly ruguloso-striolate mesially, striolate laterally, dorsal rim raised.

Description of female (male unknown). Body length 8.70–9.86 mm ($\bar{x}$=9.24 mm, SD=0.43, n=8), head width 2.56–2.71 mm (n=8), forewing length 2.63–2.75 mm ($\bar{x}$=2.66 mm, SD=0.04, n=8). Relative dimensions: HW 100, HL 81–83, UID 58–60, LID 42–43, AOD 21–22, IAD 10–12, OAD 22–23, IOD 16–17, OOD 15–16, CL 21–22, GW 18–20, EW 22–23, SL 42–45, FL 73–75.

Structure. Head broad, inner orbits converging below, median frontal carina well developed, reaches median ocelli, eyes with sparse minute setae. Scape reaching at least anterior margin of lateral ocelli. Clypeus moderately short (CL 0.52 × LID) convex ventrally, surface shining except posteriorly dull, closely to densely punctate with rounded punctures, punctures of similar size, supraclypeal area protruded, surface dull, indistinctly punctate. Frons (fig. 37A) coarsely striate above antennal bases, less so laterally, sculpture extends to posterior margin of lateral ocelli. Labrum (fig. 37B) basal median area raised, surface roughened, distal process not tapered, widest at base, medial keel spatulate distally, extends to margin, lateral ridges weak, not reaching margin, distal margin setose, lateral teeth large, some distally hooked. Pronotum dorsolateral angles bluntly obtuse, well projected. Mesoscutum (fig. 37C) anterior margin with weakly bilobed mesial projection, surface moderately coarse, anteromesially with fine transverse lines, anterolaterally plicate, anteriorly and laterally dull, mesially shining, closely punctate along midline, parapsidal areas closely to densely punctate, mesially openly to closely punctate with interspaces shining. Scutellum 1.2 × longer than dorsal surface of propodeum, surface shining, densely punctate along midline and around margin, remainder openly punctate. Dorsal surface of propodeum (fig. 12E) not defined by carinae, posterovertical surface weakly plicate, posterovertical carinae not extending halfway to dorsal surface, dorsal sculpture minutely alveolate, dull, posteriorly ruguloso-striolate mesially, striolate laterally, sculpture not reaching rim, dorsal rim raised to form distinct angle onto vertical surface, rim recessed mesially. T1 shining, anteriorly smooth and impunctate, mesially closely punctate, posterior marginal area impunctate. Mesepisternum and metepisternum striate. BP bluntly obtuse.

Colour. Body black except mandibles apically red-brown, antennal flagellum underneath, anterior margin of terga, legs and wings brown.

Vestiture. Body with moderate cover, frons and paraocular areas with long, erect, branched hair, mesoscutum with similar shorter hair, white tomentum laterally on T2, across T3 and T4.

Distribution (fig. 37D). Coastal localities in the high rainfall region of the southwestern corner of Western Australia.

Etymology. The epithet *amboquestrum* means "angular rim" and refers to the dorsal rim of the propodeum.

Floral Forage Record. None available.

Flight Phenology.

0	0	0	0	0	0	0	0	0	2	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The lack of earinae on the dorsal surfaee of the propodeum appears to be a eharaeter reversal shared by a three taxon speeies-group (*L. amboquestrum*, *L. repraesentans* and *L. teltiri*).

Lasioglossum (Chilalictus) amplexum sp. nov.

Figures 38A–H

Material examined. Holotype. ♀, South Australia, 10 km NNE of Roxby Downs (30°37′S, 136°47′E), 1 Nov 1990, KLW, on *Hakea* (NMV T-15364).

Paratypes. 37♀♀, 19♂♂, same data as holotype (NMV; ♀♀ T-15365–401, ♂♂ T-15402–420).

Other specimens examined (161♀♀, 188♂♂). Queensland: Eulo, Thargomindah, Roma, Quilpie.

New South Wales: Balranald, Pooncarie, Broken Hill, Wilcannia, Mt Boppy, Cobar, Mootwingee Nat. Pk, Tamworth, Fowlers Gap Res. Stn, Bourke.

South Australia: Taylorville, Morgan, Cowell, Pt Germein, Wambi Res. Stn, Iron Baron, Eyre Penin., Whyalla, Streaky Bay, Orroroo, Wilmington, Yunta, Ceduna, Quorn, Port Augusta, Cradock, Penong, Wilpena, Hawker, Pimba, Martins Well, Trezona Camp, Angorichina Hostel, Moolawatana, Leigh Creek, Copley, Roxby Downs, Immarna, Arkaroola, McDouall Peak HS.

Northern Territory: Erldunda, Alice Springs. Western Australia: Norseman, Buningonia Spring (Well), Mt Gibson, Paynes Find, Wannoo, Murchison River Crossing.

Diagnosis. Most like *L. albopilosum* and *L. ochrochilum*, though the presence of mesoscutal tomentum distinguishes *L. amplexum* from both speeies. Both sexes with body blaek. Female with frons elongate, finely reticulate, labrum basal median area forming tubercles, distal process short, triangular, lateral teeth absent, mesoscutum densely punetate, with distinet hair band around margin, dorsal surfaee of propodeum ruguloso-striolate, defined weakly by posterolateral earinae. Male with head similar to female, antennae moderately long (FL 2.06 × UID), legs with fore, mid and hind tarsi, fore femora, mid and hind femora basally and at apex light red-brown, S2–S4 with long plumose posteriorly directed hair, S5 with shorter, adpressed simple hair posterolaterally directed, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 5.54–6.70 mm ($\bar{x}$=6.24 mm, SD=0.32, n=10), head width 1.59–1.86 mm (n=10), forewing length 1.36–1.67 mm ($\bar{x}$=1.58 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 89–90, UID 58–59, LID 52–53, AOD 20–21, IAD 11–12, OAD 30–32, IOD 22–23, OOD 12–13, CL 20–21, GW 19–20, EW 24–25, SL 40–41, FL 76–78.

Structure. Head elongate, triangular, clypeus well projeeted below lower margins of eyes, inner orbits eonverging below, median frontal carina reaehes median ocellus, eyes with sparse cover of setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.39 × LID), flat except eonvex along ventral margin, in side view clypeus and supraelypeal area eontinue eontours of frons, clypeus shining, basally openly to elosely punetate with deeply impressed punetures, posteriorly with smaller, shallow punctures, elosely punctate, supraclypeal area not projected, shining, closely punetate. Frons (fig. 38A) elongate (FL 0.32 × HW), finely retieulate above antennal bases, pattern extends laterally to inner margins of eyes and at least posterior margin of eyes. Labrum (fig. 38B) basal median area raised forming two tubercles, anterior margin rounded mesially, forming raised lip, distal process short, triangular, widest at base, median keel spatulate extends beyond distal margin, lateral ridges weak, extend to margin, distal margin setose, lateral teeth absent. Pronotum dorsolaterally rounded, well projeeted. Mesoscutum (fig. 38C) anterior margin with rounded mesial projection, punctation moderately coarse, surface dull, anteriorly impunctate with fine transverse lines, remainder densely punetate, in parapsidal areas punetures contiguous, mesially punctures separated. Seutellum 1.3 × longer than dorsal surface of propodeum, shining, densely punctate around margin and along midline, remainder sparsely punetate. Dorsal surface of propodeum (fig. 38C) defined weakly by posterolateral carinae set just below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal seulpture ruguloso-striolate, sculpture reaches rim, dorsal rim dull. T1 densely punetate. Mesepisternum striate, metepisternum smooth. BP rounded.

Colour. Body black, mandibles light red-brown apically, antennae and legs brown, metasoma with brown tinge.

Vestiture. Body with eonspieuous eover of hair, frons with short braneheel hair, paraoeular areas with longer adpressed and erect hair, elypeus and supraelypeal area with sparse erect hair, posterior surfaee of pronotum with tomentous hair, mesoscutum with distinct hair band around margin, hair short, branched, remainder eovered with short, adpressed, simple hair, anterior margin of metanotum with tomentum,

conspicuous white adpressed hair on pleura, tomentum laterally on T2, across T3 and T4.

Description of male. Body length 4.77–5.54 mm ($\bar{x}$=5.24 mm, SD=0.28, n=10), head width 1.46–1.69 mm (n= 10), forewing length 1.18–1.41 mm ($\bar{x}$=1.32 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 93–94, UID 60–62, LID 44–45, AOD 14–16, IAD 14–15, OAD 30–31, IOD 23–25, OOD 11–13, CL 20–21, GW 17–20, EW 30–32, ML 35–40, SL 28–30, FL 125–128.

Structure. Head elongate, triangular, clypeus well projected below lower level of eyes, eyes appear slightly bulbous, inner orbits converging below, eyes appear bare, with a few minute setae, clypeus shining, convex, pale yellow on basal half, sparsely punctate, supraclypeal area shining. Antennae moderately long (FL 2.06 × UID), AS4:AS2+3=0.9. Remainder of body similar to female except mesoscutum polished, closely punctate mesially, parapsidal areas densely punctate with interspaces present, scutellum shining and impunctate, dorsal surface of propodeum not defined by carinae, dorsal sculpture not reaching rim, dorsal rim smooth and shining, body black except metasoma brown, antennae light red-brown, legs brown except fore, mid and hind tarsi, fore femora, mid and hind femora basally and at apex light red-brown, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Frons, paraocular areas and ventral margin of clypeus with short, adpressed hair forming a mat, remainder of clypeus with a few long, erect hairs, mesoscutal marginal hair band with dense pubescence along posterior margin only, conspicuous lateral tomentum on T2–T4, S2–S4 with long, plumose, posteriorly directed hair, S5 with shorter, adpressed, simple hair posterolaterally directed.

Genitalia and associated sterna (figs 38E–H). Gonobase sides flanged basally, gonocoxal setae on lateral and ventroapical area, gonostyli with long branched setae, retrorse lobes setose, well developed, ventral flanges absent, S8 median process elongate, apically rounded with a few simple setae, S7 median process rounded, glabrous.

Distribution (fig. 38D). Southern half of the Eyrean province with upper limits around the line of winter/summer rainfall (*sensu* Nix, 1982).

Etymology. The epithet *amplexum* means "encircle" and refers to the hair pattern encircling the mesoscutum.

Floral Forage Record. Families visited=10. Catch total=56; Compositae (1 catch), Fabaceae (2), Loranthaceae (4), Myoporaceae (7), Myrtaceae (18), Proteaceae (6), Sapindaceae (12), Solanaceae (2), Sterculiaceae (3), Zygophyllaceae (1). Genera visited=18; *Amyema* Van Tiegh. (2), *Atalaya* (10), *Brachychiton* Schott & Endel (3), *Cassia* L. (1), *Eremophila* (6), *Eucalyptus* (16), *Grevillea* R.Br. (1), *Hakea* (5), *Helipterum* DC. (1), *Heterodendrum* Desf. (2), *Loranthus* L. (1), *Lysiana* Van Tiegh. (1), *Medicago* L. (1), *Melaleuca* (2), *Myoporum* (1), *Nicotiana* L. (1), *Nitraria* L. (1), *Solanum* L. (1)

Flight Phenology.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6	1	3	0	0	0	0	0	4	18	31	8

Remarks. Lasioglossum amplexum is another of the black non-metallic species, restricted to the arid zone, whose character suite (labrum basal box with tubercles and raised lip, distal process triangular, without lateral teeth, elongation of the frons length) is similar to metallic species. Frons elongation occurs only on black, non-metallic species that occur in the Eyrean province. Two male specimens carried numerous hypopial mites on the underturned portion of the genae and on the plumose hairs on S2–S4.

Due to the large number of specimens available and to ensure homogeneity, the paratype series was selected from the type locality only. However, all specimens examined demonstrated the full suite of specific characters.

Lasioglossum (Chilalictus) anforticornum sp. nov.

Figures 4A, 8F, 14E, 22E–F, 39A–H

Material examined. Holotype. ♀, Western Australia, N of Carnarvon (24°53′S, 113°40′E), 6 Nov 1954, Snell (ANIC, missing left mid leg.)

Paratypes (5♀♀, 4♂♂). Western Australia, N of Carnarvon (24°53′S, 113°40′E), 6 Nov 1954, Snell (1♀ WAM 87-779, 1♂ WAM 87-780, remainder of specimens in ANIC).

Diagnosis. Female genal and male mesoventral processes unlike any other species. Both sexes body black except propodeum and metasoma brown. Female with inner orbits divergent below, frons striate, genae with spike-like processes, hypostomal area recessed, pronotal dorsolateral angles acute, vertical surface coarsely grooved, mesoscutum surface smooth and highly polished, sparsely punctate, dorsal surface of propodeum weakly ruguloso-striolate on

basal half, defined weakly by posterolateral carinae set well below dorsal level, forewings with 1st m-cu entering third submarginal cell. Male with antennae moderately long (FL 1.90 × UID), AS4:AS2+3=0.8, mesoventral area with two large, juxtaposed processes, inner surfaces coarsely setose, S2–S4 with plumose tufts, forewings with 1st m-cu entering third submarginal cell, 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.77–5.16 mm ($\bar{x}$=4.98 mm, SD=0.14, n=6), head width 1.57–1.79 mm (n=6), forewing length 1.22–1.32 mm ($\bar{x}$=1.27 mm, SD=0.03, n=6). Relative dimensions: HW 100, HL 84–85, UID 60–61, LID 62–65, AOD 20–21, IAD 14–15, OAD 30–31, IOD 18–19, OOD 16–17, CL 17–18, GW 19–20, EW 23–25, SL 35–37, FL 65–67.

Structure. Head broad, inner orbits diverging below (fig. 4A), median frontal carina reaches median ocellus, eyes with moderate cover of minute setae. Scape just reaches anterior margin of median ocellus. Clypeus short (CL 0.27 × LID), broad, flat, at distinct angle to contours of frons, surface entirely smooth and polished, sparsely to openly punctate, supraclypeal area continues contours of clypeus, almost flat, smooth and polished, sparsely punctate. Frons (fig. 39A) finely striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Genae broad behind eyes, with elongate spike-like, apically rounded processes (fig. 8F) slightly less than IAD, hypostomal area recessed (two specimens without processes). Labrum (fig. 39B) median basal area raised, nodulated forming tubercles, lateral areas weakly recessed, anterior margin rounded mesially, distal process not widest at base, weakly flanged, median keel extends to distal margin, lateral ridges weak, not extending to margin, setae not present across margin, distal setae originate submarginally, lateral teeth absent. Pronotum dorsolateral angles acute, moderately projected, vertical surface coarsely grooved. Mesoscutum (fig. 39C) anterior margin rounded, punctation fine, surface entirely smooth and highly polished, anteriorly openly punctate, remainder sparsely punctate. Scutellum 1.2 × longer than dorsal surface of propodeum, surface smooth and polished, impunctate. Dorsal surface of propodeum (fig. 14E) defined weakly by posterolateral carinae set well below dorsal level, posterovertical carinae extend greater than halfway to dorsal level, dorsal sculpture weak, basal mesial half rugulloso-striolate, laterally smooth, dorsal rim mesially and broadly in posterolateral corners with dull sheen, curved gently onto vertical surface. T1 openly to closely punctate. Mesepisternum and metepisternum finely striate on upper half. BP rounded, forewings with 1st m-cu entering third submarginal cell.

Colour. Head, mesoscutum and scutellum black, propodeum and metasoma brown, clypeus and supraclypeal area suffused with brown, scapes and antennal flagellum light brown, legs light red-brown.

Vestiture. Body sparse, frons and paraocular areas with short, adpressed, plumose hair, not forming a mat, mesoscutum and scutellum almost glabrous except with a few erect, minutely branched hairs, metanotum with small tomentum mesially, metasomal tomentum laterally on T2 and T3, broadly across T4.

Description of male. Body length 3.70–4.24 mm ($\bar{x}$=3.97 mm, SD=0.22, n=4), head width 1.36–1.55 mm (n=4), forewing length 0.96–1.10 mm ($\bar{x}$=1.02 mm, SD=0.06, n=4). Relative dimensions: HW 100, HL 83–84, UID 61–63, LID 47–48, AOD 13–14, IAD 17–18, OAD 30–31, IOD 21–22, OOD 16–17, CL 19–20, GW 19–20, EW 28–29, ML 37–38, SL 24–25, FL 118–120.

Structure. Head broad, eyes appear bulbous, inner orbits converging below, scape not reaching median ocellus, clypeus weakly convex, smooth and polished, sparsely punctate, basal half pale yellow, supraclypeal area flat, shining, sparsely punctate. Antennae moderately long (FL 1.90 × UID), AS4:AS2+3=0.8. Remainder similar to female except genal processes absent, pronotum dorsolateral processes not well projected, vertical surface coarsely grooved, mesoscutum and scutellum highly polished, sparsely punctate, dorsal surface of propodeum not defined by carinae, dorsal sculpture weakly striolate, mesoventral area with two large, elongate, apically rounded juxtaposed processes, set at right angles to body, length equal to IAD, processes parallel (figs 22E, F), inner surfaces coarsely setose, outer surfaces weakly setose (fig. 22F), colour similar to female except clypeus as noted, forewings with 1st m-cu entering third submarginal cell, 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, frons, paraocular areas, supraclypeal area and clypeus anteriorly with short, adpressed, plumose hair forming a mat, mesoscutum and scutellum almost glabrous, weak metasomal tomentum on T2 and T3, S2–S4 with long, plumose tufts across ster-

nites, almost reaching lateral margin, S2 and S3 hair on either side of midline slightly posterolateral directed leaving small mesial gap, S5 with short, adpressed, plumose hair, S6 sparse with short, simple hair.

Genitalia and associated sterna (figs 39E–H). Gonobase sides slightly narrowed basally, gonocoxite setose on apical inner margin, dorsal surface striate, gonostyli long, weakly flanged apically, with short, branched hair, retrorse lobes setose, well developed, ventral flanges absent, S8 median process elongate, broadly truncate and bilobed apically, with several setae, S7 median process rounded, glabrous.

Distribution (fig. 39D). Carnarvon, Western Australia.

Etymology. The epithet, *anforticornum*, was the unpublished name for the species coined by Tarlton Rayment. It means "see the large horn" and refers to the female genal processes.

Floral Forage Record. None available.

Flight Phenology.

0	0	0	0	0	0	0	0	0	0	1	0	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Remarks. Lasioglossum anforticornum is one of five *L. (Chilalictus)* species which exhibit female macrocephalic development, but it is the only one in which the male is not macrocephalic. The macrocephaly is expressed as a large, apically pointed, spike-like process on each gena and broadening of the clypeus. Females without genal processes have a broad clypeus, due to the divergence of the lower inner orbits margins, and enlarged genae. Males exhibit unique characters, such as the juxtaposition of, and dense vestiture on, the mesoventral processes.

Lasioglossum (Chilalictus) appositum (Rayment)

Figures 40A–H

Halictus erythrurus appositus Rayment, 1939: 281.
Homalictus appositus. — Michener, 1965: 179.
Lasioglossum (Chilalictus) appositum. — Walker, 1986: 167.

Material examined. Holotype. ♀, New South Wales, White Swamp (29°28′S, 152°48′E) (ANIC, missing left fore and hind wings.)

Other specimens examined (259♀♀, 80♂♂). Queensland: Wallangarra, Texas, Stanthorpe, Yelarbon, Goondiwindi, Inglewood, Bybera Rd, Binna Burra, Lamington Nat. Pk, Warwick, Rathdowney, Warwiek, Leslie Dam, Karara, Thargomindah, St George, Bollon, Leyburn, Sunnybank, Yowah, Mt Tambourine, Leyburn, Oxenford, Jimboomba, Mutdapilly, Ipswieh, Waeol, Brisbane, Capalaba, Murphys Creek, via Helidon, Fernvale, Oakey, Samford, Glenmorgan, Dalby, Caboolture, Tibrogargan, Condamine, Mungalla, Bunya Mts, Miles, Dulaeea, Jaekson, Yuleba, Quilpie, Roma, Amby, Mitehell, Kingaroy, Morven, Charleville, Tansey, Gayndah, Biggenden, Maryborough, Mundubbera, Taroom, Windorah, Childers, Eidsvold, Monto, Biloela, Moura, Rolleston, Springsure, Gladstone, Edungalba, Emerald, Anakie, Longreach, Rubyvale, Roekhampton, Yeppoon, Marlborough, Clermont, Sarina, Maekay, Cape Hillsborough, Mt Isa, Bowen, Townsville, Bowen, The Lynd, Paluma, Hidden Valley, Paluma, Mt Lindsay, Gregory River at Gregory Downs, Forsayth, Einasleigh, Georgetown, Croydon, Mt Surprise, Mt Garnet, Ravenshoe, Herberton, Watsonville, Petford, Almaden, Irvinebank, Gordonvale, Tolga, Chillagoe, Mareeba, Walkamin, Cairns, Kuranda, Carr Creek, Southedge, Mt Molloy, Mt Carbine, Craiglie, Palmer River, Cooktown, Blaek Mt, Laura, Laura, Bald Hills Stn, Hope Vale Mission, Mt Webb Nat. Pk, Musgrave, Lakefield Nat. Pk, Coen, Silver Plains, Melllwrath Range, Bamaga.

New South Wales: Narromine, Cobar, Coonabarabran, Fowlers Gap Res. Stn, Narrabri, Moree, Deepwater, Tenterfield.

Northern Territory: Emily Gap, Aliee Springs, Aileron, Barrow Creek, Tennant Creek, Elliott, Dunmarra, Daly Waters, Borroloola, Cape Crawford, Borroloola, Caranbirini Waterhole, Goose Lagoon, Mataranka, Katherine, Pine Creek, Mary River, Darwin, Nourlangie Roek, Mt Cahill, Oenpelli Hill.

Western Australia: Irrunytju Roekhole, Hinekley Range, Newman, Winning HS, Millstream, Broome, Kununurra.

Diagnosis. Most like *L. veronicae* and *L. victoriae* but with dull mesoscutum surfaee. Female with head and mesoscutum metallic green, latter suffused with gold, metasoma red-brown except posterior half of T1 dark green, frons striate, mesoscutum shining, densely punctate along midline and laterad of parapsidal line, mesially and in parapsidal areas openly to closely punctate, dorsal surface of propodeum rugulosostriolate, defined by posterolateral carinae set well below dorsal level, fore tibial spur fan-shaped, metasomal tomentum absent. Male with head metallic green/blue, mesoscutum dark green, metasoma dark brown, antennae moderately short (FL 1.08 × UID), AS4:AS2+3=1, sternal vestiture sparse, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.31–4.85 mm ($\bar{x}$=4.63 mm, SD=0.20, n=10), head width 1.36–1.51 mm (n=10), forewing length 1.10–1.22 mm ($\bar{x}$=1.16 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 80–82, UID

61–62, LID 58–60, AOD 18–20, IAD 13–14, OAD 31–32, IOD 21–22, OOD 14–15, CL 19–20, GW 18–19, EW 24–25, SL 32–34, FL 65–67.

Structure. Head broad, inner orbits slightly converging below, median frontal carina reaches median ocellus, upper portion weak, eyes with sparse cover of minute setae. Scape reaches just short of median ocellus. Clypeus short (0.33 × LID), almost flat, weakly convex laterally, basal half shining, mesially closely punctate with large, deeply impressed punctures and grooves running along midline, posteriorly dull, openly punctate with small, shallow, rounded punctures, supraclypeal area convex, shining, openly punctate. Frons (fig. 40A) striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of latcral ocelli. Labrum (fig. 40B) median basal area raised forming V-shaped tubercle, anterior margin bluntly obtuse, margin raised forming lip, distal process triangular, widest at base, median keel broad, extends beyond distal margin, lateral ridges large, dorsally smooth, recurved towards median keel processes, setae not present across distal margin, lateral teeth small, straight. Pronotum dorsolaterally rounded, barely projected. Mesoscutum (fig. 40C) anterior margin weakly bilobed though not to form a mesial projection, surface with a dull sheen anteriorly, shining posteriorly, punctation moderately coarse, anteriorly impunctate, dull with conspicuous transverse lines, along midline and laterad of parapsidal line densely punctate, mesially and in parapsidal areas openly to closely punctate. Scutellum length equal to dorsal surface of propodeum, surface polished, almost impunctate, a few punctures along midline. Dorsal surface of propodeum (fig. 40C) defined by posterolateral carinae set well below dorsal level, carinae angular, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate with a few striae laterally, sculpture almost reaches dorsal rim mesially, rim dull, rounded onto vertical surface. T1 densely punctate, posterior marginal area impunctate. Mesepisternum and metepisternum striate. Fore tibial spur fan-shaped, BP rounded.

Colour. Head and mesoscutum metallic green, latter suffused with gold, metasoma red-brown except posterior half of T1 dark green, mandibles amber, apically red-brown, basal half of clypeus black, posterior half and supraclypeal area metallic green/blue, antennal flagellum light brown underneath, legs with coxae, trochanters and basal two-thirds dark brown to black, remainder light red-brown.

Vestiture. Body sparse, lower paraocular areas with some adpressed, plumose hair, mesoscutum with conspicuous cover of short, simple, adpressed hair, metasomal tomentum absent.

Description of male. Body length 3.70–4.24 mm ($\bar{x}$ = 3.94 mm, SD = 0.19, n = 10), head width 1.25–1.36 mm (n = 10), forewing length 0.87–0.94 mm ($\bar{x}$ = 0.93 mm, SD = 0.03, n = 10). Relative dimensions: HW 100, HL 78–80, UID 61–62, LID 54–56, AOD 15–16, IAD 17–18, OAD 30–31, IOD 24–26, OOD 19–20, CL 19–20, GW 16–17, EW 30–31, ML 46–48, SL 23–25, FL 65–67.

Structure. Head broad though triangular, inner orbits converging below, median carina reaches median ocellus, clypeus weakly concave mesially, highly polished, impunctate, basal half bright yellow, remainder black to dark brown, supraclypeal area almost flat, smooth, impunctate. Antennae moderately short (FL 1.08 × UID), AS4:AS2+3 = 1. Remainder similar to female, frons striate, pronotum dorsolateral angles not projected, mesoscutum distinctly convex, shining, sparsely to openly punctate with minute punctures, scutellum highly polished and impunctate, dorsal surface of propodeum not defined by carinae, dorsal sculpture weakly striolate, with a few interconnectives, sculpture not reaching rim, dorsal rim polished. Colour of head metallic green/blue, mesoscutum dark green, metasoma dark brown, mandibles bright yellow, antennal flagellum light brown underneath, legs with tibiae and tarsi light yellow, remainder dark brown, forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower paraocular areas with short, adpressed, plumose hair forming a mat, frons and mesoscutum with sparse cover of short, minutely branched hair, sternal vestiture sparse, S2–S6 with short, adpressed, branched hair, S2 with a few longer, erect hairs.

Genitalia and associated sterna (figs 40E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli long, with moderate cover of long, simple hair, retrorse lobes glabrous, well developed, ventral flanges present, S8 median process elongate, apically broadly rounded and setose, S7 median process elongated, apically rounded, with a few setae.

Distribution (fig. 40D). Northern half of Australia, with a few specimens recorded from central New South Wales.

Floral Forage Record. Families visited = 11, Catch total = 253: Anacardiaceae (1 catch),

Combretaceae (2), Fabaceae (1), Loranthaceae (1), Meliaceae (1), Myrtaceae (235), Orchidaceae (2), Proteaceae (2), Rutaceae (1), Sapindaceae (4), Xanthorrhoeaceae (3). Genera visited=21: *Amyema* (1), *Angophora* Cav. (9), *Atalaya* (4), *Boronia* Sm. (1), *Caladenia* R.Br. (1), *Callistemon* R.Br. (1), *Calytrix* Labill. (1), *Dendrobium* Sw. (1), *Eucalyptus* (203), *Eugenia* L. (1), *Grevillea* (1), *Leptospermum* J.R. & G. Forst. (1), *Melaleuca* (16), *Owenia* Hilsenb. ex Meissn. (1), *Parkinsonia* L. (1), *Persoonia* Sm. (1), *Schinus* L. (1), *Terminalia* L. (2), *Thryptomene* Endl. (1), *Tristaniopsis* Brongn. & Gris. (2), *Xanthorrhoea* Sm. (3).

Flight Phenology.

18	3	13	3	14	0	1	15	15	63	126	30
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum appositum and *L. immaculatum* are the only metallic species with a predominantly northern distribution. *L. appositum* is the common *Lasioglossum* s.l. species collected throughout most of northern Queensland, including Cape York Peninsula. Several males displayed macrocephalic development.

Lasioglossum (Chilalictus) aquilonium sp. nov.

Figures 41A–D

Material examined. Holotype. ♀, Queensland, Bellenden Ker Range, Summit TV Stn (17°16′S, 145°51′E), 1560m, 17 Oct–6 Nov 1981, Earthwatch/Qld Museum, malaise trap in rainforest (QM T11683, eyes have collapsed after removal from alcohol).

Paratypes. 2♀, same data as holotype (QM T11689, one paratype gold coated.)

Diagnosis. Most like *L. bicingulatum* but with openly to closely punctate mesoscutum and dark brown legs. Female with body black, frons recessed and weakly reticulate, labrum distal margin recessed on either side of median keel, mesoscutum dull, densely punctate along midline and parapsidal areas, mesially openly to closely punctate, dorsal surface of propodeum alveolate, defined by posterior carinae curved to form lip.

Description of female (male unknown). Body length 8.09–8.32 mm ($\bar{x}$=8.20 mm, SD=0.17, n=3), head width 2.23–2.35 mm (n=3), forewing length 2.40–2.54 mm ($\bar{x}$=2.47 mm, SD=0.10, n=3). Relative dimensions: HW 100, HL 81–82, UID 60–61, LID 57–58, AOD 20–21, IAD 10–11, OAD 25–26, IOD 16–17, OOD 16–17, CL 20–21, GW 18–20, EW 23–24, SL 47–48, FL 81–83.

Structure. Head broad, inner orbits converging below, median frontal carina not reaching median ocellus, eyes with sparse cover of minute setae. Scape elongate, reaches beyond posterior margin of lateral ocelli. Clypeus short (CL 0.36 × LID), convex, shining though not polished, anterior margin dull and coarsely roughened with deeply impressed punctures, densely punctate, punctures smaller and shallower towards posterior margin, supraclypeal area dull, well projected posteriorly, openly to closely punctate. Frons (fig. 41A) recessed, not continuing contours of paraocular areas, sculpture weakly reticulate above antennal bases, sculpture laterally smooth, extends vertically to level of anterior margin of lateral ocelli. Labrum (fig. 41B) basal median area raised, surface irregularly ridged, anterior margin gently convex, not forming a curved lip, lateral areas slightly recessed, distal process not tapered, widest at base, median keel extends well beyond margin, distal margin recessed on either side of median keel, lateral ridges large, serrate, extend to margin, margin without setae across, distal setae distinctly longer than penultimate setae, with two large setae laterad of median keel, lateral teeth large, distally hooked. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 41C) anterior margin with rounded mesial projection, punctation moderately fine, surface dull except two small shining areas laterad of midline, punctures small and shallow, densely punctate along midline and parapsidal areas, mesially openly to closely punctate. Scutellum length equal to dorsal surface of propodeum length, surface dull, openly punctate except densely punctate around margins. Dorsal surface of propodeum (fig. 41C) defined by posterior carinae set at dorsal level, carinae curved posteriorly forming small sharply defined lip, posterovertical carinae reach dorsal carinae, dorsal sculpture smooth, surface alveolate, a few weak striae laterally. T1 densely punctate basally, posterior marginal area impunctate, with minute transverse lines. Mesepisternum and dorsal half of metepisternum striate, remainder smooth. BP obtuse; forewings tinged brown, with dense cover of macrotrichia.

Colour. Body black, antennae and metasoma dark brown.

Vestiture. Body sparse, frons above antennal bases with long, branched hair, paraocular areas and clypeus with shorter, simple hair; mesoscutum with distinct cover of minute hair, metanotum with dense, light brown tomentum; dorsal surface of metasoma almost bare, tomentum

almost absent, one paratype with weak lateral bands on T2–T4.

Distribution (fig. 41D). A single, high altitude (1560m) locality of Bellenden Ker Range, north Queensland.

Etymology. The epithet *aquilonium* means "northern" and refers to the distribution of the species.

Floral Forage Record. None available.

Flight Phenology.

0	0	0	0	0	0	0	0	0	1	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Only three specimens are known but the unusual character states displayed warrant species status. The high altitude areas of several North Queensland ranges and mountain tops contain a uniquely diverse insect fauna. In terms of halictid bees, several recent (unpublished) high altitude collections, made at Bellenden Ker Range and Mt Lewis, have revealed a number of unusual species. Halictid species from these sites show affinities with high altitude species found in New Guinea. These include the first Australian record of *Homalictus* (*Papualictus*) Michener, which occurs in the highlands of New Guinea and females of an undescribed metallic *L. (Parasphecodes)* species. The only known metallic species, *L. (P.) permetallicum*, was described by Michener (1965) from the New Guinea highlands (Mafulu, at 4000 feet).

Lasioglossum aquilonium is the most northern representative of a species-group, characterised by a number of unusual features, that occurs throughout the Bassian province. The distribution of this species is well beyond the established limits of the Bassian province and the species was collected in rainforest, a habitat not usually frequented by halictids.

Lasioglossum (Chilalictus) argopilatum sp. nov.

Figures 22D, 42A–H

Material examined. Holotype, ♂, New South Wales, Scone (32°03′S, 150°52′E), 13 Jan 1967, JCC, on *Wahlenbergia* (QM T13775).

Paratypes (5♂♂). Queensland, 2♂♂, 13 mi (21 km) N Stanthorpe (28°40′S, 151°56′E), 29 Dec 1958, C.D. Michener, on *Wahlenbergia* (SEM).

New South Wales, 1♂, 25 mi (40 km) W Tenterfield (29°03′S, 151°48′E), 25 Jan 1968, TFH, on *Wahlenbergia* (SAM); 2♂, same data as holotype (UQIC).

Other specimens examined (2♀♀). Queensland: Warwick, Oakey.

Diagnosis. Most like *L. aureopilatum* (see *Remarks* below) but differs by characters listed in key (couplet 121). Both sexes black. Female with frons finely striate, mesoscutum dull, closely to densely punctate, dorsal surface of propodeum micro-alveolate, not defined by carinae, mesoventral area with hair branched on anterior surface of hair shaft only. Male with antennae moderately long (FL 1.61 × UID), AS4:AS2+3=0.7, mesoventral area with two apically rounded processes, S2–S4 with rows of erect, apically curved, posteriorly directed, plumose hair, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.47–4.62 mm (n=2), head width 1.46–1.48 mm (n=2), forewing length 1.18–1.20 mm (n=2). Relative dimensions: HW 100, HL 81–82, UID 65–66, LID 52–54, AOD 18–19, IAD 12–13, OAD 27–28, IOD 20–21, OOD 19–20, CL 19–20, GW 14–16, EW 27–28, SL 34–35, FL 67–69.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus eyes with sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.37 × LID), weakly convex, entire surface shining, openly punctate with shallow, rounded punctures, anterior margin impunctate, supraclypeal area almost flat, weakly raised mesially, sparsely punctate with minute, indistinct punctures. Frons (fig. 42A) finely striate above antennal bases, sculpture continues laterally almost to eyes except weakly punctate along inner orbits, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 42B) basal median area raised, nodulated, nodules forming weak tubercles, anterior margin rounded mesially, distal process not widest at base, distally flanged, median keel extends to distal margin, lateral ridges absent, setae not present across distal margin, distal setae originating submarginally, lateral teeth small, partially hooked distally. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 42C) anterior margin rounded, surface dull with fine reticulate pattern, punctation moderately fine, anteriorly impunctate, mesially and in parapsidal areas closely to densely punctate with small, shallow rounded punctures. Scutellum 1.4 × longer than dorsal surface of propodeum, surface dull, openly to closely punctate. Dorsal surface of propodeum (fig. 42C) not defined by carinae, posterovertical carinae extend less than halfway to dorsal level, dorsal sculpture smooth to micro-alveolate except a few weak striae along

basal margin, dorsal rim gently rounded to vertical surface. T1 densely punctate. Mesepisternum and metepisternum finely striate. BP rounded.

Colour. Head and mesosoma black, metasoma brown except clypeus and propodeum suffused with brown, antennal flagellum underneath light brown, legs brown to light brown.

Vestiture. Body sparse, frons with some erect, branched hair, paraocular areas with semi-adpressed, minutely branched hair, mesoscutum with sparse, erect, minutely branched hair, mesoventral area with hair branched on anterior surface of hair shaft only (cf. figs 25C, 25D), metasomal tomentum laterally on T2, across T3 and T4, S2 and S3

Description of male. Body length 4.08–4.70 mm ($\bar{x}$=4.39 mm, SD=0.26, n=5), head width 1.39–1.53 mm (n=5), forewing length 1.13–1.22 mm ($\bar{x}$=1.16 mm, SD=0.03, n=5). Relative dimensions: HW 100, HL 86–87, UID 65–66, LID 51–52, AOD 17–18, IAD 13–14, OAD 25–26, IOD 19–20, OOD 20–21, CL 19–20, GW 16–17, EW 27–28, ML 36–38, SL 28–29, FL 104–106.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, clypeus weakly convex, surface shining, indistinctly openly to closely punctate with small, shallow, rounded punctures, basal half pale yellow, supraclypeal area flat, shining, impunctate though surface finely roughened. Antennae moderately long (FL 1.61 × UID), AS4:AS2+3=0.7. Body similar to female, frons finely striate, pronotum dorsolaterally rounded, moderately projected, mesoscutum dull, openly to closely punctate mesially, parapsidal punctures indistinctly openly punctate, dorsal sculpture of propodeum micro-alveolate with a few weak striae basally, T1 densely punctate, mesoventral area with two large, apically rounded processes projecting at right angles to body (fig. 22D), processes well separated by distance greater than IAD; colour similar to female except tarsi white/pale yellow, forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Paraocular areas with long, plumose, adpressed, white hair forming a mat, frons with erect, simple and branched hair not forming a mat, mesepisternum with conspicuous cover of long, erect, plumose hair, weak metasomal tomentum laterally on T2 and T3; S2–S4 with rows of erect, apically curved, posteriorly directed, white, plumose hair, S5 and S6 with sparse, semi-adpressed, simple hair.

Genitalia and associated sterna (figs 42E–H) Gonobase slightly narrowed basally, gonocoxite with setae on apical inner margin, dorsal surface coarsely striate, gonostyli long, apically flanged, with long, branched hair, retrorse lobes setose, well developed, ventral flanges absent, penis valves angular apically; S8 median process elongate, narrowly tapered to rounded apex, setose, S7 rounded, glabrous.

Distribution (fig. 42D). High altitude tablelands of southeastern Queensland and northern and central New South Wales.

Etymology. The epithet *argopilatum* means "with white hair" and refers to the male sternal vestiture.

Floral Forage Record. Family visited=1. Catch total=3; Campanulaceae (3 catches). Genus visited, *Wahlenbergia* (3).

Flight Phenology.

3	0	0	0	0	0	0	0	0	1	0	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The external sculpture characteristics of both sexes and the male genital complex are almost identical to those of *L. aureopilatum*. Only males are easily separated by the shape and size of the mesoventral processes and the sternal vestiture. As the association of the female is tentative, the two female specimens have not been included in the type series.

Male holotypes have been chosen for *L. argopilatum* and *L. aureopilatum* as they possess the species diagnostic characters.

Lasioglossum (Chilalictus) asperithorax (Cockerell)

Figures 26F, 43A–H

Halictus asperithorax Cockerell, 1910b: 274.
Halictus excusus Cockerell, 1930: 42. syn. nov.
Lasioglossum (Chilalictus) asperithorax. — Michener 1965: 175.
Lasioglossum (Chilalictus) excusum. — Michener, 1965: 176.

Material examined. Holotype of *asperithorax*. ♀, Victoria, Melbourne (37°49′S, 144°58′E). Turner Coll., 1907–7. BM Type Hym 17.a.917 (BMNH, right hind leg detached and glued to card, right mandible moved to expose labrum.)

Holotype of *excusus*. ♂, Tasmania, Pyengana (41°19′S, 147°54′E), 31 December 1915, F.M. Littler, BM Type Hym 17.a.984 (BMNH, missing left antennal pedicel and flagellar segments.)

Other specimens examined (34♀♀, 29♂♂). New South Wales and Australian Capital Territory: Nullo Mtn, Mountain Lagoon, Kurrajong, Mt Tomah, Wentworth

Falls, Galong, Jugiong, Lees Spring, Brindabella Range, Braidwood, Clyde Mt, Currowan St. Forest, Thredbo, Mt Kosciusko.

Victoria: Mt Buffalo, Lake Mountain, Mt Evelyn, Melbourne, Easton Portal, Upper Beaconsfield.

Tasmania: Pyengana, St Helens, Elephant Pass, Wayatinah, Hobart.

Diagnosis. Most like *L. clelandi* but mesoscutum sculpture is scabrous. Both sexes with body black. Female with frons striate, clypeus dull, labrum median keel spatulate, lateral teeth present, mesoscutum punctation conspicuously coarse, scabrous anterolaterally, rim of each puncture raised, dorsal surface of propodeum defined by posterolateral carina, posterolateral areas flanged at dorsal level. Male with antennae long, similar mesoscutal sculpture to female, S3–S5 with lateral, plumose hair tufts, mesially bare; forewing with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.39–8.62 mm ($\bar{x}$=8.00 mm, SD=0.47, n=10), head width 2.31–2.54 mm (n=10), forewing length 2.04–2.33 mm ($\bar{x}$=2.17 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 77–80, UID 60, LID 56–58, AOD 21–22, IAD 10, OAD 23–25, IOD 15–17, OOD 16, CL 18–19, GW 15–18, EW 23–26, SL 38–41, FL 63–65.

Structure. Head distinctly wider than long, inner orbits converging below, median frontal carina well developed, reaching median ocellus, eyes with sparse, short setae. Scape reaching well beyond lateral ocelli. Clypeus relatively short (CL 0.33 × LID), weakly convex, entirely dull, covered with microtessellation, closely punctured, punctures elliptical, supraclypeal area not markedly protruded, dull, closely to openly punctured. Frons (fig. 43A) striate/punctate above antennal bases, reticulate laterally, sculpture extends to level of lateral ocelli. Labrum (fig. 43B) basal median area raised to distal margin, surface roughened with raised carina apically, distal process flanged apically, median keel spatulate, extends beyond distal margin, lateral ridges absent, lateral teeth present, small, hooked. Pronotum dorsolateral angles obtuse, projecting. Mesoscutum (fig. 43C) anterior margin with weakly bilobed mesial projection, punctation conspicuously coarse, surface dull, scabrous anterolaterally, remainder densely punctate mesially and on parapsidal areas, rim of each puncture raised, irregular in shape, forming part of adjoining puncture rim. Scutellum 1.2 × longer than dorsal surface of propodeum, dull, weakly reticulate. Dorsal surface of propodeum (fig. 43C) defined by posterolateral carina, posterolateral areas flanged at dorsal level, posterovertical carinae almost reaching dorsal surface, sculpture mesially ruguloso-striolate, laterally striolate, reaching rim. T1 densely punctate. Mesepisternum with horizontal striae, basal 30% weakly reticulate, metepisternum striate; BP obtuse.

Colour. Body black except mandibles dark red-brown, pedicle, antennal flagella, legs and anterior half of metasomal terga.

Vestiture. Body sparse; face with erect, white, plumose hair except upper frons and vertex with brown hair; weak lateral tomentum on T2 and T3.

Description of male. Body length 6.16–7.24 mm ($\bar{x}$=6.64 mm, SD=0.37, n=10), head width 1.93–2.16 mm (n=10), forewing length 1.64–1.86 mm ($\bar{x}$=1.76 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 78–80, UID 61–62, LID 46–48, AOD 16–17, IAD 12–13, OAD 25–26, IOD 17–18, OOD 16–17, CL 21–23, GW 15–17, EW 25–27, ML 37–39, SL 28–30, FL 148–152.

Structure. Head broad; inner orbits converging below, eyes with sparse, minute setae; sculpture similar except median frontal carina not reaching and scape just reaching median ocellus; clypeus slightly convex, openly punctured with weak, elliptical punctures, basal three-quarters with dull yellow marking; supraclypeal area weakly protruded, impunctate, microtessellate. Antennae long (FL 2.44 × UID), AS4: AS2+3=1. Remainder of body similar to female but mesoscutal puncture rim not as raised or irregular; propodeum not defined by carinae, posterolateral areas not flanged; mesoventral area broadly recessed wider than interocellar distance, with short simple hair; forewing with 2nd r-m as strong as 1st r-m.

Vestiture. Similar to female except some adpressed hair in lower paraocular areas, mesoventral hair short and simple; S3–S5 with lateral, plumose hair tufts, mesially glabrous (fig. 26F).

Genitalia and associated sterna (figs 43E–H). Gonobase slightly narrowed basally, gonocoxite setose on apical inner margin, gonostyli setae long with branched and simple setae present, retrorse lobes setose, well developed, ventral flanges present; S8 median process shape truncate apically, with simple setae, S7 median process rounded.

Distribution (fig. 43D). Southeastern Australia.

Floral Forage Record. Family visited = 1. Catch total = 2; Fabaceae (2 catches). Genera visited = 2; *Daviesia* Sm. (1), *Pultenaea* Sm. (1).

Flight Phenology

9	1	2	0	0	0	0	2	4	5	4	5
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum asperithorax is part of a species-group (others include *L. clelandi* and *L. orbatum*) which is characterised by the shape of the propodeum. No intraspecific variation was noted.

Lasioglossum (Chilalictus) aspratulum sp. nov.

Figures 27A, 44A–H

Material examined. Holotype ♀. Victoria, 4 km E of Warracknabeal (36°15′S, 142°26′E), 25 Feb 1982, KLW, on *Eucalyptus campaspe* (NMV T-15421).

Paratypes. 25♀♀, 3♂♂, Same data as holotype (NMV; ♀♀ T-15422–15446; ♂♂ T-15447–15449).

Other specimens examined (57♀♀, 19♂♂). Queensland: Toobeah, Cunnamulla, St Ruth, Condamine, Roma, Quilpie, Roma, Morven, Charleville.

New South Wales: Conargo, Kinchega Nat. Pk, Trangie, Mendooran, Gilgandra, Narrabri, Moree, Barringun.

Victoria: Donald, Warracknabeal, Donald, Gunbower. South Australia: Waikerie, Quorn.

Diagnosis. Most like *L. hemichalceum* and *L. appositum* but with doubly punctate sculpture on mesoscutum. Female with head metallic green, mesoscutum metallic green tinged with blue and copper, metasomal tergites dark green to black with posterior marginal areas light brown, frons striate, mesoscutum punctation coarse, densely punctate, punctures on anterior half contiguous, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae, fore tibial spur fan shaped. Male body dark green with copper tinge, labrum distal process produced as in female, antennae moderately long (FL 1.71 × UID), AS4:AS2+3 = 0.8, dorsal surface of propodeum defined by posterolateral carinae, S2–S4 with dense cover of short, posteriorly directed hair across posterior area of sternites, S3–S4 with denser cover than S2, S4 with median hair tuft, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.47–5.16 mm ($\bar{x}$ = 4.89 mm, SD = 0.21, n = 10), head width 1.39–1.63 mm (n = 10), forewing length 1.13–1.34 mm ($\bar{x}$ = 1.27 mm, SD = 0.06, n = 10). Relative dimensions: HW 100, HL 78–80, UID 60–62, LID 56–57, AOD 18–19, IAD 13–14, OAD 30–31, IOD 24–25, OOD 13–14, CL 19–20, GW 17–18, EW 25–26, SL 35–37, FL 63–65.

Structure. Head broadly triangular, inner orbits slightly converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape just reaches anterior margin of median ocellus. Clypeus short (CL 0.35 × LID), convex along ventral margin, entire surface shining, with several broad, deeply impressed punctures mesially, laterally with smaller, shallow punctures, posterior margin impunctate, with fine reticulate pattern, supraclypeal area slightly raised, dull, openly punctate with small, indistinct punctures. Frons (fig. 44A) striate above antennal bases, sculpture laterally weakens to punctate along inner margins of eyes, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 44B) median basal area forming raised V-shaped tubercles, anterior margin rounded mesially, forming raised lip along margin, distal process not triangular, not tapered, widest at base, median keel weakly spatulate distally, reaches distal margin, lateral ridges weak, dorsally smooth, almost reach margin, setae originate on margin, not extending across margin, lateral teeth not distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 44C) anterior margin rounded, punctation coarse, except along margin densely punctate, punctures on anterior half contiguous, posteromesially and in parapsidal area with small interspaces present, contiguous along posterior margin. Scutellum length equal to dorsal surface of propodeum, surface smooth and highly polished, sparsely punctate except densely punctate along midline, with minute punctures. Dorsal surface of propodeum (fig. 44C) defined by posterolateral carinae set well below dorsal level, carinae angular, posterovertical carinae reach dorsal carinae, dorsal sculpture coarsely ruguloso-striolate, reaches rim mesially and laterally, dorsal rim smooth, gently rounded to vertical surfaces. T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum finely striate. Fore tibial spur fan-shaped; BP rounded.

Colour. Head metallic green, mesoscutum metallic green tinged with blue and copper, scutellum metallic green, propodeum dark green, metasomal tergites dark green to black with posterior marginal areas light brown, mandibles amber, red-brown apically, underneath of antennal flagellum brown, legs with apical third of femora, tibiae and tarsi light red-brown, remainder dark green.

Vestiture. Lower frons and paraocular areas with some semi-erect, minutely branched hair, not forming a mat, upper frons with short simple and sparse, erect, minutely branched hair, mesoscutum with sparse, short, erect hair, posterior margin with narrow tomentum, metanotum with long, erect hairs, metasomal tomentum laterally on T2 and T3, weakly across T4.

Description of male. Body length 4.24–4.54 mm ($\bar{x}$=4.37 mm, SD=0.11, n=10), head width 1.41–1.48 mm (n=10), forewing length 1.08–1.15 mm ($\bar{x}$=1.10 mm, SD=0.03, n=10). Relative dimensions: HW 100, HL 77–79, UID 60–61, LID 56–58, AOD 15–16, IAD 14–15, OAD 28–29, IOD 20–21, OOD 14–15, CL 18–20, GW 16–17, EW 28–30, ML 40–43, SL 30–32, FL 102–104.

Structure. Head broad, inner orbits weakly converging below, median frontal carina reaches median ocellus, clypeus smooth and shining, slightly concave along ventral margin, almost entirely bright yellow except small brown area along posterior margin, supraclypeal area flat; labrum distal process produced as in female except slightly smaller, without median keel, lateral ridges or lateral teeth. Antennae moderately long (FL 1.71 × UID), AS4:AS2+3=0.8. Remainder similar to female, frons striate, pronotum dorsolateral angles not projected, mesoscutum smooth and shining, closely punctate with minute punctures, scutellum smooth, polished and impunctate, dorsal surface of propodeum defined by angular posterolateral carinae set well below dorsal level, dorsal sculpture broadly striate, dorsal rim smooth and polished. Body dark green with copper tinge except clypeus and mandibles yellow, fore and mid tibiae and tarsi light red-brown, hind tibiae light red-brown at base and apex, remainder of legs dark brown. Forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Paraocular areas with dense cover of short, adpressed, minutely branched hair forming a mat, similar hair on lower frons and supraclypeal area though not forming a mat, mesoscutum with sparse cover of erect hair, metasomal tomentum absent; S2–S4 with dense cover of short, posteriorly directed hair across posterior area of sternites, S3 and S4 with more dense cover than S2, S4 with median hair tuft, S5 and S6 with sparse cover of minute setae (fig. 27A).

Genitalia and associated sterna (figs 44E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli large, apically broad, dorsal surface densely covered with long, erect, branched hair, retrorse lobes glabrous, well developed, ventral flanges present; S8 median process apically rounded and setose, S7 median process apically rounded and glabrous.

Distribution (fig. 44D). Central southern Queensland, western New South Wales and south central South Australia; in the dry, intermediate region between the desert zone and the western side of the Great Dividing Range in eastern Australia.

Etymology. The epithet *aspratulum* means "roughened" and refers to the sculpture on the mesoscutum.

Floral Forage Record. Families visited=4. Catch total=23; Campanulaceae (1 catch), Fabaceae (1), Myrtaceae (16), Sapindaceae (5). Genera visited=5; *Atalaya* (5), *Cassia* (1), *Eucalyptus* (15), *Melaleuca* (1), *Wahlenbergia* (1).

Flight Phenology.

5	1	3	0	0	0	0	0	2	6	6	8
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The coarse mesoscutum punctation, propodeum sculpture and angular propodeal posterolateral carinae readily distinguish this species. Minimal variation is present but the mesoscutum is blue on one female specimen (Gilgandra, UQIC). Several males have macrocephalic development. The labrum distal process of the female is unusual. On metallic species this process is usually triangular with large recurved lateral ridges. Although these characters do not occur on the labrum of *L. aspratulum*, the basal box has raised tubercles and the anterior margin forms a curved lip, characters usually associated with metallic species.

Lasioglossum (Chilalictus) athrix sp. nov.

Figures 12F, 45A–H

Material examined. Holotype. ♀, South Australia, Cape Borda, Kangaroo Is. (35°45′S, 136°35′E), 3 Oct 1970, TFH, on pigface (SAM).

Paratypes (8♀♀, 5♂♂). South Australia: 2♀♀, Hinch Nat. Pk (33°50′S, 136°09′E), 12 Oct 1973, C.A. & TFH, on dandelion (SAM) (one specimen gold coated; other specimen with metasoma and right hind leg glued to card); 1♀, Port Lincoln (34°44′S, 135°52′E), Oct 1929, F.E. Wilson (NMV T-15450); 3♂♂, North Glenelg (34°58′S, 138°32′E), 18 Aug 1964, TFH, on *Mesembryanthemum* (SAM, genitalia glued to card); 1♀, Monarto Con. Pk (35°03′S, 139°07′E), 18 Sep 1990, L. Jansen, on *Boronia coerulescens* (SAM, head

detached, pinned to pith); 1♀, Ferries McDonald Nat. Pk (35°13′S, 139°09′E), 13 Oct 1977, E.G. Matthews (SAM); 2♀♀, same data as holotype (SAM); 1♀, 2♂♂, West Beach (37°10′S, 139°44′E), 27 Aug 1965, TFH, on flowers (SAM, male genitalia glued to card.)

Diagnosis. Most like *L. amboquestrum*. Both sexes with body black. Female with frons coarsely striate, labrum median keel spatulate distally, mesoscutum anterior margin with weakly bilobed mesial projection, striate along midline; dorsal surface of propodeum defined posterolaterally by carinae posterovertical surface plicate, dorsal rim and angular, recessed mesially. Male paraocular area with long adpressed and erect plumose hair forming dense mat; S2–S4 with plumose hair, S5 and S6 almost bare; gonocoxite setose on apical inner margin, retrorse lobes well developed, glabrous.

Description of female. Body length 8.70–10.16 mm ($\bar{x}$=9.36 mm, SD=0.49, n=8), head width 2.35-2.66 mm (n=8), forewing length 2.35–2.89 mm ($\bar{x}$=2.16 mm, SD=0.17, n=8). Relative dimensions: HW 100, HL 80–81, UID 58–60, LID 53–54, AOD 21–22, IAD 10–11, OAD 21–22, IOD 17–18, OOD 15–16, CL 21–22, GW 18–20, EW 22–25, SL 43–45, FL 74–76.

Structure. Head broad, inner orbits converging below, median frontal carina well developed, reaches median ocellus, eyes with sparse minute setae. Scape reaching at least anterior margin of lateral ocelli. Clypeus short (CL 0.41 × LID), convex ventrally, shining except anteriorly dull, closely punctate with small, rounded punctures, supraclypeal area dull, indistinctly punctate. Frons (fig. 45A) coarsely striate above antennal bases, sculpture extends to posterior margin of lateral ocelli. Labrum (fig. 45B) median area raised, sculpture roughened, distal process not tapered, widest at base, median keel spatulate distally, reaches distal margin, lateral ridges weak not reaching margin, distal margin setose, lateral teeth large, slightly hooked distally. Pronotum dorsolateral angles bluntly obtuse, well projected. Mesoscutum (fig. 45C) anterior margin with weakly bilobed mesial projection, sculpture moderately coarse, anteromesially with fine transverse lines, anterolaterally plicate, mesially surface shining except on anterior half, striae meet at posteriorly directed oblique angle along midline and continue almost to posterior margin, parapsidal area and laterad of parapsidal lines densely punctate, remainder shining and closely punctate. Scutellum length equal to or 1.05 × dorsal surface of propodeum, weakly concave and densely punctate mesially, remainder shining and openly punctate. Dorsal surface of propodeum (fig. 12F) defined posterolaterally by carinae set well below dorsal level, posterovertical surface plicate, carinae reach dorsal carinae, dorsal sculpture minutely alveolate, ruguloso-striolate mesially, striolate laterally, dorsal rim raised and angular, recessed mesially. T1 smooth basally, close to densely punctured mesially, impunctate along posterior marginal area. Mesepisternum and metepisternum striate. BP rounded.

Colour. Head and mesosoma black except mandibles red-brown, antennal flagellum underneath and legs brown, in one specimen metasoma brown (holotype) or metasoma black with anterior margin of terga brown.

Vestiture. Body with moderate cover, frons and paraocular areas with long erect branched hair, mesoscutum with similar but shorter hair, white tomentum laterally on T2, across T3 and T4.

Description of male. Body length 8.70–9.01 mm ($\bar{x}$=8.86 mm, SD=0.16, n=3), head width 2.19–2.35 mm (n=3), forewing length 2.12–2.26 mm ($\bar{x}$=2.20 mm, SD=0.07, n=3). Relative dimensions: HW 100, HL 84–85, UID 62–63, LID 46–47, AOD 17–18, IAD 12–13, OAD 21–22, IOD 18–19, OOD 17–18, CL 21–22, GW 18–19, EW 27–28, ML 40–41, SL 32–33, FL 120–122.

Structure. Head broad, inner orbits converging below, clypeus weakly convex, closely to densely punctate with shallow punctures, surface shining, anterior three-quarters pale yellow, supraclypeal area protruded. Antennae moderately long (FL 1.94 × UID), AS4:AS2+3=1. Remainder of body similar to female but mesoscutal striations absent, dorsal surface of propodeum not defined by carinae, dorsal sculpture reaches rim; colour similar to female except metasoma brown; forewing with 2nd r-m as strong as 1st r-m.

Vestiture. Frons sparsely covered with minutely branched and simple hair, paraocular area with long adpressed and erect plumose hair forming dense mat; mesoscutum as in female; lateral tomentum on T2–T4. S2–S4 with plumose posteriorly directed hair across anterior margin of sterna, S5 and S6 almost bare.

Genitalia and associated sterna (figs 45E–H). Gonobase sides slightly narrowed basally, gonocoxite setose on apical inner margin, gonostyli with long, simple setae and a few weakly branched setae, retrorse lobes well developed, glabrous, ventral flanges present; S8 and S7

median processes apically rounded, both with simple setae.

Distribution (fig. 45D). Southeastern coastal area of South Australia on both sides of Spencer Gulf.

Etymology. The epithet *athrix* refers to the lack of setae on the retrorse lobes on the male genitalia.

Floral Forage Record. Families visited=3. Catch total=4; Aizoaceae (2 catches), Compositae (1), Rutaceae (1). Genera visited=4; *Boronia* (1), *Carpobrotus* N.E. Brown (1), *Mesembryanthemum* L. (1), *Taraxacum* Weber. (1).

Flight Phenology.

0	0	0	0	0	0	0	2	1	4	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Similar to *L. amboquestrum*, especially the sculpture and shape of the dorsal surface of propodeum although *L. athrix* is distinguished by the presence of posterolateral propodeal carinae and striation along the midline of the mesoscutum. The label data of the few known specimens suggest that *L. athrix* is univoltine with a flight period from August to October.

Lasioglossum (Chilalictus) aureopilatum sp. nov.

Figures 25C, 27B, 46A–H

Material examined. Holotype. ♂, Australian Capital Territory, Canberra (35°18′S, 149°08′E), 26 Oct–3 Nov 1946, E.F. Riek (ANIC).

Paratypes. 2♀♀, 2♂♂, same data as holotype (ANIC).

Diagnosis. Most like *L. argopilatum*. Both sexes with head and mesosoma black, metasoma brown. Female with frons striate, mesoscutum dull, openly to closely punctate, mesoventral area with hair branched on anterior surface of hair shaft only, dorsal surface of propodeum micro-alveolate, not defined by carinae. Male with antennae short (FL 0.97 × UID), AS4:AS2+3=0.4, mesoventral area with small, broadly rounded, widely separated processes, S3 emarginate mesially, S2 with long, plumose hair, posterolaterally directed, S3–S4 with short, simple, golden coloured, adpressed hair posteromesially directed, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.85–4.93 mm (n=2), head width 1.50–1.53 mm (n=2), forewing length 1.20–1.25 mm (n=2). Relative dimensions: HW 100, HL 79–80, UID 67–68, LID 53–54, AOD 20–21, IAD 13–14, OAD 27–28, IOD 21–22, OOD 19–20, CL 19–20, GW 14–16, EW 27–28, SL 33–34, FL 60–62.

Structure. Head broad, inner orbits converging below, median frontal carina well developed, reaches median ocellus eyes with sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.37 × LID), weakly convex, basally shining, densely punctate with deeply impressed, rounded punctures, anterior margin dull with transverse lineolation, impunctate, supraclypeal area almost flat, weakly raised mesially, openly punctate with minute, indistinct punctures. Frons (fig. 46A) finely striate above antennal bases, sculpture laterally extends almost to eyes except weakly punctate along inner orbits, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 46B) basal median area raised, nodulated, nodules forming weak tubercles, anterior margin rounded mesially, distal process not widest at base, distally flanged, median keel extends to distal margin, lateral ridges absent, setae not present across distal margin, distal setae originating slightly in from margin, lateral teeth small, partially hooked distally. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 46C) anterior margin rounded, surface dull with fine reticulate pattern, punctation moderately fine, anteriorly impunctate, mesially and in parapsidal areas openly to closely punctate with small, shallow rounded punctures. Scutellum 1.2 × longer than dorsal surface of propodeum, surface dull, openly to closely punctate. Dorsal surface of propodeum (fig. 46C) not defined by carinae, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture smooth to micro-alveolate except a few weak striae along basal margin with a few interconnectives mesially, dorsal rim gently rounded to vertical surface. T1 densely punctate. Mesepisternum and metepisternum smooth except a few striae on upper portion. BP rounded.

Colour. Head and mesosoma black, metasoma brown except clypeus suffused with brown, antennal flagellum underneath light brown, legs brown.

Vestiture. Body sparse, frons with some erect, branched hair, paraocular areas with semi-adpressed, minutely branched hair, mesoscutum with sparse, erect, minutely branched hair, mesoventral area with hair weakly branched, branches occur on anterior surface of hair shaft

only (fig. 25C), metasomal tomentum laterally on T2, across T3 and T4, S2 and S3 hair branched.

Description of male. Body length 3.93–4.16 mm ($\bar{x}$=4.06 mm, SD=0.12, n=3), head width 1.46–1.55 mm (n=3), forewing length 1.08–1.15 mm ($\bar{x}$=1.12 mm, SD=0.04, n=3). Relative dimensions: HW 100, HL 83–84, UID 70–72, LID 50–51, AOD 16–17, IAD 16–17, OAD 24–25, IOD 21–22, OOD 20–21, CL 19–20, GW 17–18, EW 26–27, ML 36–37, SL 30–31, FL 68–70.

Structure. Head broad, inner orbits converging below, eyes with moderate cover of short setae, clypeus weakly convex, shining, indistinctly punctate, basal half pale yellow remainder black, supraclypeal area flat, shining, appear impunctate. Antennae short (FL 0.97 × UID), AS4:AS2+3=0.4. Remainder similar to female except pronotum dorsolateral angles weakly projected, mesoscutum openly punctate mesially, sparsely punctate in parapsidal areas, scutellum sparsely to openly punctate, dorsal sculpture of propodeum almost entirely microalveolate, metasomal tergites impunctate, mesoventral area near mid coxae with short, broadly rounded, widely separated (greater than IAD) processes set at right angles to body, area between processes recessed; S3 emarginate mesially, S4 weakly emarginate mesially (fig. 27B); forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body with moderate cover, frons, paraocular areas, supraclypeal area and anterior margin of clypeus densely covered with white, adpressed, plumose hair forming a mat, mesoscutum with moderate cover of long, erect, branched hair, weak metasomal tomentum laterally on T2 and T3; S2 with long, plumose hair, anteriorly hair erect, posteriorly hair semi-adpressed, all hair posterolaterally directed, S3 and S4 with short, simple, golden coloured, adpressed hair posteromesially directed except with mesial gap, S5 and S6 with short, simple adpressed hair (fig. 27B).

Genitalia and associated sterna (figs 46E–H). Gonobase slightly narrowed basally, gonocoxite without setae, dorsal surface coarsely striate, gonostyli long, apically flanged, with long, simple and branched hair, retrorse lobes setose, well developed, ventral flanges absent, penis valves angular apically; S8 median process elongate and setose, constricted apically to form a rounded knob, S7 median process rounded, glabrous.

Distribution (fig. 46D). Australian Capital Territory.

Etymology. The epithet *aureopilatum* means "with golden hair" and refers to the hair on the male S3–S4.

Floral Forage Record. None available.

Flight Phenology.

0	0	0	0	0	0	0	0	0	1	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. This species has not been collected since 1946 and, as such, may be classed as extinct (50 year limit). The absence of material since 1946 may simply reflect non-collection of the species. However, entomologists at the Australian National Insect Collection (ANIC) have conducted long-term collecting (e.g. malaise trapping) in the Canberra region. Alternatively, the species may be extremely local and its biology may be in synchrony with its presumed food plant, *Wahlenbergia.* However, in the past few years, Glynn Maynard has made extensive collections on *Wahlenbergia* throughout Canberra, but has not recollected the species. (See *Remarks* under *L. argopilatum* for type selection.)

Lasioglossum (Chilalictus) baudini (Cockerell)

Figures 15A, 27C, 47A–H

Halictus baudini Cockerell, 1915b: 102–103.
Lasioglossum (*Chilalictus*) *baudini*. — Michener, 1965: 175.

Material examined. Syntype. ♂, Tasmania, Mt Wellington (42°54′S, 147°14′E), Jan–March 1913, Turner. BM Type Hym 17.a.926 (BMNH).

Other specimens examined (30♀♀, 21♂♂). New South Wales and Australian Capital Territory: Kosciusko Nat. Pk, Dainers Gap, Mt Gingera.

Victoria: Lake Mountain, Dinner Plain, Falls Creek, Mt Buffalo.

Tasmania: Mt Wellington, Mt Barrow, Waratah.

South Australia: Flinders Chase Nat. Park, Kangaroo Island.

Diagnosis. Most like *L. opacicolle.* Both sexes black. Female with frons striate, mesoscutum surface dull, anterolaterally with transverse plicae, mesially openly to closely punctate, parapsidal areas reticulate, dorsal surface of propodeum striolate, not defined by carina, T1 posterior marginal area impunctate. Male with antennae moderately long (FL 2.35 × UID), AS4:AS2+3=1, S3–S4 with lateral hair tufts, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.39–8.39

mm ($\bar{x}$=7.89 mm, SD=0.31, n=10), head width 2.16–2.30 mm (n=10), forewing length 2.16–2.40 mm ($\bar{x}$=2.26 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 78–81, UID 62–63, LID 55–57, AOD 21–22, IAD 10, OAD 22–23, IOD 16, OOD 18–19, CL 21–22, GW 16–17, EW 20–22, SL 41–42, FL 71–72.

Structure. Head broad, inner orbits converging below, median frontal carina short, not reaching half distance to median ocellus, eyes with conspicuous cover of setae of various lengths. Scape reaches at least anterior margin of lateral ocelli. Clypeus short (CL 0.38 × LID), almost flat, basal half shining with several well-separated, large, deeply impressed punctures, remainder dull with fine lineolation, sparsely to openly punctate with small, rounded punctures, supraclypeal area well projected anteriorly, surface dull, sparsely punctate with small punctures. Frons (fig. 47A) striate above antennal bases, sculpture laterally smooth along inner orbits, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 47B) basal median area raised, distinctly nodulated, each nodule with single, central seta, anterior margin rounded mesially, distal process not tapering, widest at base, median keel short, extends to distal margin, lateral ridges absent, distal margin setose, lateral teeth large, distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 47C) anterior margin with rounded, weakly produced, mesially projection, punctation fine mesially, moderately coarse laterally, surface dull, anteromesially impunctate, anterolaterally with transverse plicae that continue into parapsidal areas, mesially openly to closely punctate with small, shallow punctures, laterad of parapsidal lines densely punctate, parapsidal areas impunctate though with raised reticulate pattern. Scutellum 1.25 × longer than dorsal surface of propodeum, dull with fine lineolation, openly punctate mesially, densely punctate around margin. Dorsal surface of propodeum (fig. 15A) not defined by carina, posterovertical carinae extend less than halfway to dorsal surface, dorsal sculpture weak, surface micro-alveolate and striolate, some specimens weakly ruguloso-striolate mesially, sculpture reaching dorsal rim. T1 openly punctate on anterior half, posterior marginal area impunctate. Mesepisternum and metepisternum smooth except a few striae on upper portion of metepisternum. BP bluntly obtuse.

Colour. Body black except, mandibles apically dark red-brown, antennae, legs and posterior marginal areas of tergites brown.

Vestiture. Body sparse, frons and paraocular areas with long, erect, branched setae, clypeus and mesoscutum with similar shorter minutely branched hair, tomentum laterally on T2 and T3, aeross T4.

Description of male. Body length 6.78–7.47 mm ($\bar{x}$=7.21 mm, SD=0.24, n=6), head width 1.93–2.23 mm (n=6), forewing length 1.90–2.23 mm ($\bar{x}$=2.05 mm, SD=0.12, n=6). Relative dimensions: HW 100, HL 82–83, UID 66–67, LID 51–52, AOD 20–21, IAD 11–13, OAD 23, IOD 17–18, OOD 21–22, CL 20–22, GW 18, EW 26–27, ML 38–40, SL 29–30, FL 155–158.

Structure. Head broad, inner orbits converging below, eyes with conspicuous cover of moderately long setae, sculpture similar to female except clypeus flat, with a dull sheen, sparsely punctate, basal half white/pale yellow marking. Antennae moderately long (FL 2.35 × UID), AS4:AS2 + 3 = 1. Remainder of body similar to female except mesoscutal punctation mesially closely to densely punctate, dorsal surface of propodeum sculpture ruguloso-striolate mesially, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, frons, lower paraocular areas and scapes with erect, long, plumose hair, none forming a mat, metasomal tomentum absent, S2 with long, branched hair across, S3 and S4 with lateral tufts of long, branched hair, mesial hair short and simple, S5 and S6 with sparse, short hair, a few long hairs laterally on S5 (fig. 27C).

Genitalia and associated sterna (figs 47E–H). Gonobase sides parallel, gonocoxite setose on apical inner margin and lateral setae present, gonostyli thickened, forming partial shield above gonocoxites, upper surface densely covered with short simple setae with a few longer setae apically, retrorse lobes setose, ventral arm of lobes short and narrow, ventral flanges present; S8 median process elongate, apically truncate, with simple setae present apically and laterally, S7 median process rounded, glabrous.

Distribution (fig. 47D). Mainly at high altitude localities throughout southeastern Australia, Tasmania and southern South Australia.

Floral Forage Record. Families visited = 4. Catch total = 8; Compositae (1 catch), Fabaceae (1), Myrtaceae (5), Umbelliferae (1). Genera visited=4; *Bossiaea* (1), *Conium* L. (1), *Eucalyptus* (5), *Senecio* L. (1).

Flight Phenology.

3	5	3	0	0	0	0	0	0	1	4	4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Halictus baudini was described from three males. I have examined only one of this series but the specimen viewed had "type" written in Cockerell's handwriting, on the locality label. No intraspecific variation was noted.

Lasioglossum (Chilalictus) bibrochum sp. nov.

Figures 48A–H

Material examined. Holotype. ♀, Queensland, Sandringham Stn, 55 km NW of Bedourie (24°03'S, 139°03'E), 1979–1980, S. Morton, on sand ridge, or stony plain (ANIC).

Paratype. 1♀, same data as holotype (ANIC)

Other specimen examined (1♂). New South Wales, Walgett.

Diagnosis. Most like *L. cambagei* but has two teeth on inner hind tibial spur. Both sexes with head and mesosoma black, metasoma brown (female) or black (male). Female with head broad, clypeus convex, ventral margin almost at right angles to epistomal suture, frons punctate with some long, adpressed, plumose hair, mesoscutum with a dull sheen, openly punctate mesially, densely punctate laterad of parapsidal lines and in parapsidal areas, mesoventral area with hair minutely branched on anterior surface only, dorsal surface of propodeum rugulosostriolate, not defined by carinae, T1 impunctate on posterior marginal area and small posterolateral areas, inner hind tibial spur with two teeth. Male with face densely covered with long, adpressed, plumose, hair forming a thick white mat, antennae moderately short (FL 1.08 × UID), AS4:AS2+3=0.4, mesoscutum highly polished, mesoventral area with two large, juxtaposed processes, genital capsule with retrorse lobes absent, forewings with 1st m-cu (recurrent vein) entering third submarginal cell, 2nd r-m weaker than 1st r-m.

Description of female. Body length 6.85–7.01 mm (n=2), head width 1.81–1.83 mm (n=2), forewing length 1.69–1.72 mm (n=2). Relative dimensions: HW 100, HL 78–80, UID 72–73, LID 59–60, AOD 23–24, IAD 12–13, OAD 25–26, IOD 21–22, OOD 21–22, CL 17–18, GW 19–20, EW 23–24, SL 39–40, FL 63–65.

Structure. Head distinctly broadened, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.3 × LID), barely projected beyond lower level of eyes, convex so that ventral margin almost at right angles to epistomal suture, basal half shining and closely punctate with large, deeply impressed punctures, anteriorly dull, densely punctate with small, rounded punctures, supraclypeal area weakly raised mesially, with a dull sheen, densely punctate except small anteromesial area openly punctate. Frons (fig. 48A) coarsely punctate above antennal bases, punctures on either margin of frontal carina aligned to form several striae, sculpture laterally weakens to well separated punctures, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 48B) median basal area raised, coarsely nodulated, anterior margin mesially rounded, distal process not tapered, slightly wider at base, median keel extends to distal margin, weakly spatulate, lateral ridges weak, set at oblique angle to median keel, extend to distal margin, setae not present across margin and originate submarginally, lateral teeth small, distally hooked. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 48C) anterior margin rounded, surface with a dull sheen covered with conspicuous reticulate pattern except two small mesial areas shining, closely to densely punctate along midline, openly punctate mesially, densely punctate laterad of parapsidal lines and in parapsidal areas. Scutellum 1.2 × longer than dorsal surface of propodeum, surface shining and sparsely punctate except along midline dull and closely punctate. Dorsal surface of propodeum (fig. 48C) not defined by carinae, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture rugulosostriolate mesially, striolate laterally, sculpture not reaching dorsal rim, rim bluntly obtuse. T1 densely punctate except impunctate on posterior marginal area and small posterolateral areas. Mesepisternum and metepisternum finely striate on upper half only, remainder smooth. Inner hind tibial spur with two teeth, distal margin wavy; BP rounded.

Colour. Head and mesosoma black, metasoma brown, mandibles red-brown, antennal flagellum brown underneath, tergites dark brown except posterior marginal areas light brown, legs light brown.

Vestiture. Body moderate, lower half of frons and paraocular areas with long, adpressed, plumose hair almost forming a mat, clypeus with some short, minutely branched hair, mesoscutum with conspicuous cover of long, erect, branched hair, mesoventral area with hair minutely branched on anterior surface only, meta-

somal tomentum laterally on T2, aeross T3 and T4.

Description of male. Body length 6.01mm, head width 1.93mm, forewing length 1.60mm. Relative dimensions: HW 100, HL 76, UID 72, LID 50, AOD 20, IAD 13, OAD 22, IOD 21, OOD 22, CL 18, GW 16, EW 31, ML 36, SL 33, FL 78.

Structure. Head eonspicuously broad, eyes bulbous in frontal and side views, inner orbits eonverging below, eycs with sparse eover of setae, seapes reaehes anterior margin of lateral ocelli. elypeus set at distinct angle to frons, supraelypeal area flat, shining, clypeus black. Antennae moderately short (FL 1.08 × UID), AS4:AS2+3=0.4. Remainder similar to female except frons eoarsely punctate, mesoseutum highly polished except dull and impunctate anteriorly, mesially openly punetate, elosely punctate in parapsidal areas, mesoventral area with two large, elongate, apically rounded, juxtaposed proeesses set at right angles to body, process length equal to IAD, inner and outer surfaee sparsely setose, forewings with 1st m-cu (recurrent vein) enters third submarginal cell. 2nd r-m weaker than 1st r-m.

Vestiture. Body with moderately cover, frons, paraocular areas, elypeus and supraclypeal area densely covered with long, adpressed, plumose, setae forming a thick mat, mesosoma with conspicuous cover of long, erect, branched hair, metasomal tomentum present on T2 and T3; sternal vestiture sparse, S2 and S3 with some long, erect, branehed setae, S4–S6 with short, minutely branched setae.

Genitalia and associated sterna (figs 48E–H). Gonobase slightly flanged basally, gonocoxite with stout setae on apical inner margin, gonostyli with long simple hairs apically, retrorse lobes and ventral flanges absent (fig. 48E); S8 median process elongate, apically broadly truncate, setose with simple setae some setae spinelike, S7 median process truncate apically, with a few setae.

Distribution (fig. 48D). Western Queensland and New South Wales.

Etymology. The epithet *bibrochum* means "two projecting teeth" and refers to the inner hind tibial spur.

Floral Forage Record. None available.

Flight Phenology.

0	0	0	0	0	0	0	0	1	0	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Assoeiation of the sexes is based on morphologieal similarities (head shape, clypeal angle, frons, mesoseutum and T1 seulpture patterns) rather than eoineident eollection. Thus, the single male specimen was not included in the paratype series. The lack of retrorse lobes on the male gonocoxite is highly unusual.

Lasioglossum (Chilalictus) biceps sp. nov.

Figures 19E, 49A–H

Material examined. Holotypc. ♀, South Australia, 63 km W Ceduna (32°08′S, 133°09′E), 27 Oct 1989, KLW, on *Eremophila* (NMV T-15451).

Paratypes (10♀♀, 8♂♂). South Australia: 1♀, 7 km W of Immarna RS (30°30′S, 132°06′E), 8 Nov 1975, TFH, on blue flowered *Eremophila* (SAM); 2♀♀, 10 km WNW of Penong (31°53′S, 132°54′E), 14 Oct 1981, IDN & JCC, on flowers of *Eucalyptus* (ANIC); 6♀♀, 3♂♂, same data as holotype (NMV; ♀♀ T-15452–15457, ♂♂ T-15458–15460); 1♂, Gawler Ranges (32°37′S, 135°44′E), 11 Oct 1970, H. & J. Ehmann, on *Eucalyptus* (SAM); 1♀, Lake Gilles Nat. Pk (32°56′S, 136°46′E), 27 Oct 1974, C.A. & TFH, on flowers of *Eremophila scoparia* (SAM).

Western Australia, 4♂♂, 10 km W of Eucla (31°43′S, 128°48′E), 28 Oct 1989, KLW, on *Eucalyptus* (NMV T-15461–15464).

Diagnosis. Most like *L. inflatum*, differs in metasomal colour. Female with body black, frons striate, pronotal dorsolaterally rounded, not projected, mesoscutum punctation fine, surface dull, closely to densely punctate, dorsal surface of propodeum ruguloso-striolate, weakly defined by posterolateral earinae, fore tibial spur fan shaped. Male with antennae moderately long (FL 2.09 × UID), fore femora underneath with enlarged boss basally, fore coxae with dense hair cover, S2 hair extends to lateral margins, S3 and S4 with posterolaterally directed hair, S5 with posteromesially directed hair.

Description of female. Body length 4.31–4.77 mm ($\bar{x}$=4.57 mm, SD=0.16, n=9), head width 1.22–1.32 mm (n=9), forewing length 1.13–1.34 mm ($\bar{x}$=1.23 mm, SD=0.07, n=9). Relative dimensions: HW 100, HL 96–98, UID 61–62, LID 57–58, AOD 19–20, IAD 9–10, OAD 36–37, IOD 27–28, OOD 14–15, CL 21–22, GW 17–18, EW 25–26, SL 34–35, FL 78–80.

Structure. Head elongate, inner orbits converging below, median frontal earina reaches median ocellus, upper portion of carina weak, eyes with sparse cover of minute setae. Scape just short of reaching median ocellus. Clypeus mostly projected below lower level of eyes, short (CL 0.38 × LID), flat except weakly convex ventrally, basal half with a dull sheen, openly to

sparsely punctate with small shallow punctures, anteriorly dull, covered with fine reticulate pattern, impunctate, supraclypeal area almost flat, dull, covered with fine reticulate pattern, with a few indistinct punctures. Frons (fig. 49A) striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 49B) basal median area raised, weakly ridged, anterior margin bluntly obtuse mesially, weakly raised forming lip, anterolateral corners angular, distal process not tapered, widest at base, median keel extends beyond distal, lateral ridges small, not extending to margin, setae not present across distal margin, lateral teeth small, distally hooked. Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 49C) anterior margin rounded, punctation moderately fine, surface dull covered with fine reticulate pattern, anteriorly impunctate, remainder closely to densely punctate with small shallow rounded punctures. Scutellum length equal to dorsal surface of propodeum length, surface dull, openly punctate. Dorsal surface of propodeum (fig. 49C) weakly defined by posterolateral carinae set well below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal sculpture ruguloso-striolate, not reaching dorsal rim, rim with a dull sheen. T1 and T2 densely punctate. Mesepisternum and metepisternum weakly striate to smooth. Fore tibial spur fan-shaped; BP rounded.

Colour. Body black except, mandibles red-brown apically, antennae brown, tergites with posterior marginal areas brown, fore and mid tibiae and tarsi light red-brown.

Vestiture. Body sparse, a few long, branched hairs in paraocular areas, clypeus almost bare, frons with short hair and a few longer branched hairs, mesoscutum with short erect branched hair, weak tomentum laterally on T2, across T3 and T4.

Description of male. Body length 4.16–4.70 mm ($\bar{x}$=4.43 mm, SD=0.22, n=6), head width 1.18–1.27 mm (n=6), forewing length 1.13–1.22 mm ($\bar{x}$=1.17 mm, SD=0.04, n=6). Relative dimensions: HW 100, HL 90–92, UID 60–64, LID 48–50, AOD 16–18, IAD 10–12, OAD 32–33, IOD 26–28, OOD 14–16, CL 18–20, GW 17–18, EW 30–31, ML 38–39, SL 32–33, FL 134–136.

Structure. Head elongate, inner orbits converging below, eyes appear bulbous in frontal view, with distinct cover of short setae, clypeus shining, appears impunctate, pale yellow on basal half, supraclypeal area flat, with a dull sheen. Antennae moderately long (FL 2.09 × UID), AS4:AS2+3=1. Remainder of body similar to female except, mesoscutum shining except dull along midline, surface openly to closely punctate, scutellum highly polished almost impunctate, dorsal surface of propodeum posterolateral carinae present though weak, dorsal rim shining; body black except clypeus as noted, flagellum light brown underneath, tergites with posterior marginal area brown, legs with apical portion of femora, fore and mid tibiae and all tarsi light red-brown (some specimens pale white), fore femora underneath with enlarged boss basally, apically surface smooth, broad and slightly concave (fig. 19E); forewings with 2nd r-m as weaker than 1st r-m.

Vestiture. Lower frons, paraocular areas, clypeus and supraclypeal area with short, adpressed, plumose hair forming a mat, fore coxae with dense hair cover, remainder similar to female except lateral tomentum just present on T2 and T3; S2 with semi-erect, branched hair extending to lateral margins, S3 and S4 with short, branched adpressed posterolaterally directed hair, S5 with short, simple, adpressed, posteromesially directed hair.

Genitalia and associated sterna (figs 49E–H). Gonobase sides narrowed basally, gonocoxite without setae, gonostyli long, apically enlarged, with a few short setae except several large thickened spine-like setae on apical inner margin, retrorse lobes weakly developed, finely setose, ventral flanges absent; S8 median process elongate, tapered, apically pointed, with a few short, simple setae, S7 median process rounded, glabrous.

Distribution (fig. 49D). Coastal zone of the Great Australian Bight from Eucla to the Eyre Peninsula.

Etymology. The epithet *biceps* refers to the enlarged femora of the male.

Floral Forage Record. Families visited=2. Catch total=6; Myoporaceae (3 catches), Myrtaceae (3). Genera visited=2; *Eremophila* (3), *Eucalyptus* (3).

Flight Phenology.

0	0	0	0	0	0	0	0	0	5	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The males of *Lasioglossum biceps*, *L. bubrachium* and *L. inflatum* have the basal posterior area of the fore femora grossly inflated. Restricted to the southern Eyrean province,

Lasioglossum biceps and *L. bubrachium* are parapatric and both species are allopatric with *L. inflatum*. They share characters common to the arid metallic species (triangular labrum and increased frons length), but are black non-metallic species. They are resemble each other and females are separated by different punctation frequencies on the mesoscutum and colour of the metasoma. The male of each species is distinguished by differences in flagellum length, vestiture on the fore coxa and sterna and genitalia characters.

Lasioglossum (Chilalictus) bicingulatum (Smith)

Figures 8D, 12A, 19A,C, 50A–H

Halictus bicingulatus Smith. 1853: 57.
Halictus leai Cockerell, 1910a: 237. syn. nov.
Halictus sanguinipes Cockerell. 1914a: 513. syn. nov.
Halictus haematopus Cockerell, 1914e: 307. syn. nov.
Halictus festivus Rayment, 1935: 707–708. syn. nov.
Lasioglossum (Chilalictus) bicingulatum. — Michener, 1965: 175.
Lasioglossum (Chilalictus) leai. — Michener, 1965: 176.
Lasioglossum (Chilalictus) sanguinipes. — Michener, 1965: 177.
Lasioglossum (Chilalictus) haematopum. — Michener, 1965: 176.
Lasioglossum (Chilalictus) festivum. — Michener, 1965: 176.

Material examined. Holotype of *bicingulatus*. ♀, presumed lost. (Absence from BMNH confirmed by Mr G. Else. Several other museums were contacted but with no success.) Published locality is "Australia, Melbourne, Coll. W.H.L. Walcott".

Holotype of *leai*. ♀, Victoria. C.F., Turner coll. 1910-7. BM Type Hym 17.a.968 (BMNH, missing both hind tarsi and the last three flagellar segments of the right antenna.)

Holotype of *sanguinipes*. ♂, Victoria, Windsor (37°52′S, 144°59′E). French. 182, USNM Type No. 58177 (USNM, missing right antenna, distal five flagellar segments of left antenna, left fore tibia and tarsi.)

Holotype of *haematopus*. ♂, Tasmania, Launceston (41°26′S, 147°08′E), F.M. Littler, 238c, 2326, BM Type Hym 17.a.989 (BMNH, glued to a card, genital capsule removed and glued to the card.)

Holotype of *festivus*. ♀, specimen has no locality data other than "68c" (ANIC). Published locality is "Vic.-West Warburton".

Other specimens examined (543♀♀, 304♂♂). Queensland: Wallangarra, Stanthorpe, Levers Plateau, Lamington Nat. Pk, Leyburn, Sunnybank, Mt Tambourine, Birnum Range, Ipswich, Toowoomba, Mt Gravatt, Oxley, Capalaba, Mt Crosby, Brisbane, Glasshouse Mts, Beerwah, Bunya Mts, Landsborough, Killarney, Montville, Maroochydore, Nambour, Kenmore, Serpentine Creek, Mt Walsh Nat. Pk, Biggenden, Dallarnil, Springsure, Blackdown Tableland, Herberton, Mt Carbine.

New South Wales and Australian Capital Territory: Nadgee Nature Reserve, Narrabeen, Nelligen, Royalla, Canberra, Browning, Jervis Bay, Nowra, Goulburn, Bulli, Bargo, Helensburgh, Picton, Bundeena, Heathcote, Como, Macquarie Fields, La Perouse, Sydney, Blue Mts, Grose Vale, Mt Vic., Kurrajong, Mt Tomah, Glossodia, Copacabana, Bilpin, Clarence, Avoca Beach, Point Clare, Gosford, Leets Vale Hawkesbury, Bathurst, Bateau Bay, Wisemans Ferry, Ourimbah, Tuggerah, Graman, Maitland, Mudgee, Taree, Wingham, Wauchope, Coonabarabran, White Cliffs, Armidale, Bellingen, Grafton, Woollahra, Burringbar, Murwillumbah.

Victoria: Lorne, Anglesea, Rye, Hazelwood, Gorae West, Beaconsfield, Cobboboonee State Forest, Erica, Dingley,, Oakleigh, Brighton, Powelltown, Melbourne, Lakes Entrance, Woori Yallock, Warburton district, Bruthen, Cann River, Genoa, Flowerdale, Broadford, Omeo, Stawell, St Arnaud.

Tasmania: Dunalley, Hobart, St Helens, Launceston.

South Australia: Mt Gambier, Hackney, Mt Compass, Adelaide.

Diagnosis. Most like *L. aquilonium*, see that species. Both sexes black, female metasomal posterior marginal areas light red-brown. Female with frons above antennal bases weakly concave, reticulate, mesoscutum anterior margin distinctly bilobed, surface dull, densely punctate, dorsal surface of propodeum weakly ruguloso-striolate, defined posteriorly by carinae just below dorsal surface, carinae form a ridge. Male with antennae long, AS4: AS2+3=1.4, paraocular areas hair forming a mat, S2 with posteriorly directed hair, S3 and S4 with posterolaterally directed hair, S5 and S6 with posteromesially directed hair.

Description of female. Body length 8.24–9.39 mm ($\bar{x}$=8.92 mm, SD=0.36, n=10), head width 2.30–2.56 mm (n=10), forewing length 2.28–2.61 mm ($\bar{x}$=2.44 mm, SD=0.12, n=10). Relative dimensions: HW 100, HL 79–82, UID 55–57, LID 55–57, AOD 21–22, IAD 8–9, OAD 24–26, IOD 15–16, OOD 14–15, CL 21–22, GW 19–22, EW 25–29, SL 45–46, FL 76–78 .

Structure. Head broad, inner orbits approximately parallel, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of lateral ocelli. Clypeus short (CL 0.39 × LID), weakly convex (some specimens flat mesially),

basal half with a dull sheen, coarsely roughened with large, deeply impressed, irregular shaped punctures, some joined though not forming grooves, anteriorly dull, openly to closely punctate with small, rounded punctures, supraclypeal area weakly projected, with a dull sheen, openly punctate with small, rounded punctures. Frons (fig. 50A) weakly concave and reticulate/punctate above antennal bases, sculpture laterally paraocular areas elevated, sculpture weakens to almost smooth, extends vertically onto vertex. Labrum (figs 8D, 50B) basal median area raised weakly nodulated forming small tubercles, distal process not tapered, widest at base, median keel extends well beyond distal margin, distal margin distinctly notched, setae not present across margin, distal setae distinctly longer than penultimate setae, lateral ridges large, serrate, extend to distal margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 50C) anterior margin with strongly bilobed mesial projection, punctation moderately coarse, surface dull, anteriorly impunctate, with fine transverse lineolation, remainder densely punctate, anteromesially interspaces present, remainder with punctures contiguous. Scutellum 1.2 × longer than dorsal surface of propodeum, surface dull, coarsely roughened, densely punctate. Dorsal surface of propodeum (fig. 12A) defined posteriorly by carinae just below dorsal surface, carinae form a defined ridge, posterovertical carinae extend to dorsal carinae, dorsal sculpture weakly ruguloso-striolate sculpture on basal half only, surface with fine alveolate pattern, sculpture not reaching rim. T1 densely punctate. Mesepisternum and metepisternum finely striate. BP rounded; forewing with 1st m-cu entering second submarginal cell (fig. 19A).

Colour. Head and mesosoma black, metasoma brown, except mandibles red-brown apically, clypeus tinged with brown, flagellum brown above, light brown underneath, posterior marginal area of tergites light red-brown, legs brown with tibiae and tarsi light red-brown.

Vestiture. Body sparse, frons and paraocular areas with erect, minutely branched hair, clypeus and supraclypeal area almost glabrous, mesoscutum with short, adpressed hair and a few erect hairs, metanotum with dense tomentose hair cover, T2–T4 with dense tomentum across tergites.

Description of male. Body length 5.39–8.08 mm ($\bar{x}$=7.31 mm, SD=0.62, n=10), head width 1.62–2.02 mm (n=10), forewing length 1.53–2.04 mm ($\bar{x}$=1.89 mm, SD=0.14, n=10). Relative dimensions: HW 100, HL 87–89, UID 58–61, LID 47–48, AOD 16–17, IAD 12–13, OAD 24–25, IOD 17–18, OOD 17–18, CL 21–22, GW 18–20, EW 29–31, ML 38–39, SL 28–29, FL 170–173.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of minute setae, clypeus weakly convex, with a dull sheen, almost impunctate though with several shallow, wide punctures, at least anterior half pale yellow, supraclypeal area shining, impunctate. Antennae long (FL 2.84 × UID), AS4:AS2+3=1.4. Remainder of body similar to female except mesoscutum densely punctate mesially with shining interspaces, dorsal surface of propodeum posterior carinae weaker, with similar sculpture, colour similar except posterior marginal area brown to light brown, tomentum almost absent, weak lateral tufts on T2–T4, legs with femora brown, tibiae and tarsi light red-brown, some specimens with mid and hind femora light red-brown; forewing with 2nd r-m as strong as 1st r-m (fig. 19C).

Vestiture. Body sparse, similar to female except paraocular areas with dense, adpressed, branched hair forming a mat, frons with some branched hair, mostly erect, short, simple hair, S2 with long, erect, branched, posteriorly directed hair across sternite, S3 and S4 with similar hair posterolaterally directed, S5 and S6 with sparse, short, adpressed hair posteromesially directed.

Genitalia and associated sterna (figs 50E–H). Gonobase sides slightly flanged basally, gonocoxite with lateral setae present, gonostyli with dense cover of long, simple hair on upper surface, several thickened setae apically, retrorse lobes setose basally, well developed, ventral flanges large and glabrous; S8 median process elongate, rounded, with long, simple setae; S7 median process rounded, glabrous.

Distribution (fig. 50D). Eastern zone of the Bassian province, with a few records from north Queensland.

Floral Forage Record. Families visited=5. Catch total=85; Anacardiaceae (1 catch), Fabaceae (4), Myrtaceae (78), Oleaceae (1), Pittosporaceae (1). Genera visited=14; *Acacia* (2), *Angophora* (2), *Baeckea* L. (1), *Bursaria* Cav. (1), *Callistemon* (2), *Eucalyptus* (50), *Jacksonia* R.Br. (1), *Kunzea* Reichb. (1), *Leptospermum* (5), *Ligustrum* L. (1), *Melaleuca* (8), *Pultenaea* (1), *Schinus* (1), *Tristaniopsis* (9).

Flight Phenology.

40	35	20	5	8	1	0	1	13	43	31	43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Although the type of *Halictus bicingulatus* is lost, no neotype has been proposed as I consider there to be confusion about the identity of this species. Smith's description lists a number of the diagnostic characters and I have examined numerous specimens identified by various taxonomists without finding a single misidentification. The only inaccuracy has been the common use of the epithet *leai*. Indeed, Cockerell (1914) described *L. leai* as a variety of *Halictus bicingulatus*. Several female specimens carried hypopial nymphal mites and one female specimen had two strepsipteran puparia lodged under T5.

Lasioglossum (Chilalictus) bicolor sp. nov.

Figures 51A–H

Material examined. Holotype. ♀, Victoria, 19 km S Murrayville (35°26′S, 141°11′E), 10–11 Mar 1977, TFH, on *Eucalyptus* (SAM).

Paratypes (32♀♀, 1♂). Victoria: 7♀♀, 1♂, same data as holotype (SAM); 1♀, Wilkur (36°03′S, 142°41′E), 15 Nov 1955, Spurrell (NMV T-15465); 1♀, Glenelg Riv., 4 mi NNE of Nelson (38°01′S, 141°01′E), 25 Nov 1966, A. Neboiss (NMV T-15466).

South Australia: 1♀, Red Cliffs (34°15′S, 138°10′E), 20 Dec 1957 (ANIC); 5♀♀, 52 km N of Hwy 1 on Pinnaroo Rd (34°50′S, 140°55′E), 8 Nov 1988, R.R. Snelling & J. Grey, on *Eucalyptus* (LACM); 4♀♀, Billiatt Nat. Pk (34°50′S, 140°30′E), 24 Jan 1972, TFH, on mallee *Eucalyptus* (SAM); 1♀, 37 km N of Hwy 1 on Pinnaroo Rd (34°58′S, 140°55′E), 8 Nov 1988, R.R. Snelling & J. Grey, on *Eucalyptus* (LACM); 1♀, Scinta Rosa Winery, 9 km NNE of Goolwa (35°25′S, 138°49′E), 25 Oct 1990, L. Jansen, on *Leptospermum myrsinoides* (NMV T-15467); 1♀, Ngarkat Con. Park, 35 km SSW of Lameroo (35°38′S, 140°30′E), 1 May 1991, L. Jansen, on *Leucopogon cordifolius* (NMV T-15468); 1♀, 25 km E of Meningie (35°40′S, 139°36′E), 11 Nov 1990, L. Jansen, on *Halgania cyanea* (NMV T-15469); 1♀, Messent Con. Park, 12 km WNW of Salt Creek (36°06′S, 139°47′E), 23 Mar 1991, L. Jansen, on *Melaleuca lanceolata* (NMV T-15470).

Western Australia: 1♀, East Yuna Nature Reserve, 34 km WNW of Mullewa (28°32′S, 115°15′E), 23–24 Sep 1983, C.A. & TFH, 559-18, on flowers of *Melaleuca scabra* (WAM 87/297); 1♀, 13 km NNW of Eneabba (29°49′S, 115°16′E), 9–12 Sep 1987, TFH, on flowers of *Melaleuca seriata* (WAM 90/85); 1♀, Canning Mills (32°04′S, 116°06′E), 16 May 1986, R. Peakall, 1286, on flowers of *Eriochilus dilatatus* (WAM 90/157); 3♀♀, Tutanning Reserve (32°38′S, 116°03′E), 18–25 km E of Pingelly, 30 Oct–3 Nov 1980, TFH, 368-5 on *Beaufortia mierantha puberula* (WAM 87/139), 368-17 on *Hibbertia* (WAM 87/146), 368-14 on *Boronia capitata* (WAM 87/144); 1♀, 3 km N of Hopetown (33°55′S, 120°08′E), 5 Jan 1986, G. & A. Daniels (UQIC); 1♀, NW foot of Whoogarup Range, Fitzgerald River Nat. Pk (33°56′S, 119°50′E), 29 Dec 1978, TFH, 246, in sandy track (WAM 87/85).

Other specimens examined (10♀♀, 3♂♂). New South Wales: Como.

South Australia: Ngarkat Conservation Park, Box Flat, Kangaroo Island.

Western Australia: Jurien Bay.

Diagnosis. Most like *L. ochrochilum* but with complete tomentum across T2. Female with head and mesosoma black, metasoma light red-brown clypeus light brown basally, frons coarsely punctate, mesoscutum densely punctate, dorsal surface of propodeum rugulosostriolate, weakly defined by posterolateral carinae set just below dorsal level. Male with antennae moderately short (FL 1.8 × UID), AS4:AS2+3=0.7, S2–S4 with long, plumose posteriorly directed hair, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 5.24–6.39 mm ($\bar{x}$=5.81 mm, SD=0.32, n=10), head width 1.69–1.93 mm (n=10), forewing length 1.34–1.55 mm ($\bar{x}$=1.45 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 88–89, UID 58–59, LID 49–51, AOD 18–19, IAD 9–10, OAD 28–29, IOD 18–19, OOD 13–14, CL 22–23, GW 17–18, EW 24–25, SL 38–39, FL 64–66.

Structure. Head triangular, inner orbits converging below, median frontal carina not reaching median ocellus, eyes with distinct cover of short setae. Scape reaches at least anterior margin of median ocellus. Clypeus moderately long (CL 0.5 × LID), mostly projected below lower levels of eyes, weakly convex, surface polished, mesially with a few large, deeply impressed punctures, laterally almost impunctate, anteriorly openly to closely punctate, supraclypeal area weakly projected, surface polished, openly punctate. Frons (fig. 51A) coarsely punctate above antennal bases, sculpture laterally weakens to punctate with smooth interspaces, extends vertically to just beyond anterior margin of median ocellus. Labrum (fig. 51B) basal median area slightly raised, with a few setae, anterior margin rounded, laterally weakly recessed, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges prominent, serrate, almost extend to margin, setae not present across distal margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles sharply obtuse, well projected. Mesoscutum (fig. 51C) anterior margin

rounded, punctation moderately coarse, surface shining, anteriorly impunctate with fine transverse lines, remainder densely punctate, along midline and in parapsidal areas punctures almost contiguous, mesially distinct interspaces present. Scutellum 1.2 × longer than dorsal surface of propodeum, surface shining, openly to closely punctate. Dorsal surface of propodeum (fig. 51C) weakly defined by posterolateral carinae set just below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate mesially, a few striae laterally, sculpture just reaches rim mesially, rim dull. T1 densely punctate. Mesepisternum and metepisternum striate. BP rounded.

Colour. Head and mesosoma black, metasoma light red-brown except clypeus light brown anteriorly, mandibles dark red-brown apically, flagellum light brown underneath, legs brown.

Vestiture. Body sparse, frons and paraocular areas with erect, branched hair, clypeus and supraclypeal area almost glabrous, a few minutely branched hairs, mesoscutum with weak pattern: mesial hair orientation directed laterally, parapsidal hair orientation directed mesially directed, hair mat along posterior margin.

Description of male. Body length 4.23mm, head width 1.37mm, forewing length 1.08mm. Relative dimensions: HW 100, HL 92, UID 60, LID 48, AOD 16, IAD 12, OAD 29, IOD 20, OOD 18, CL 19, GW 17, EW 30, ML 38, SL 28, FL 110.

Structure. Head triangular, inner orbits converging below, eyes with a few minute setae, scape not reaching median ocellus, clypeus and supraclypeal area polished, almost impunctate, basal half of clypeus pale yellow. Antennae moderately short (FL 1.8 × UID), AS4:AS2+3=0.7. Remainder of body similar to female except frons weakly punctate, mesoscutum openly to closely punctate, surface polished, hair pattern absent except weak hair tuft along posterior margin, dorsal surface of propodeum not defined posterolaterally by carinae, dorsal sculpture not reaching rim, dorsal rim smooth and shining, body colour similar to female except clypeus as noted, base of mandibles light yellow; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Frons and paraocular areas with short, adpressed, branched hair, not forming a mat, metasoma without tomentous hair, S2–S4 with long, plumose, posteriorly directed hair.

Genitalia and associated sterna (figs 51E-H). Gonobase sides parallel, gonocoxite with several setae on apical inner margin, gonostyli elongate with weakly branched hair, retrorse lobes setose, well developed, ventral flanges present; S8 median process apically rounded, with a few setae, S7 median process rounded, glabrous.

Distribution (fig. 51D). Eastern and western zones of the Bassian province with a preference for dry coastal or inland localities.

Etymology. The epithet *bicolor* refers to the two-tone colour of the body and clypeus.

Floral Forage Record. Families visited=7. Catch total=21; Dilleniaceae (2 catches), Ehretiaceae (1), Epacridaceae (1), Myrtaceae (14), Orchidaceae (1), Proteaceae (1), Rutaceae (1). Genera visited=11; *Beaufortia* R.Br. (1), *Boronia* (1), *Calytrix* (2), *Eriochilus* R.Br. (1), *Eucalyptus* (4), *Grevillea* (1), *Halgania* Gaudich (1), *Hibbertia* (2), *Leptospermum* (1), *Leucopogon* R.Br. (1), *Melaleuca* (6).

Flight Phenology.

2	0	2	0	2	0	0	0	3	6	13	2
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. One female specimen has in excess of 100 hypopial nymphal mites on the underturned area of the genae, across the fore coxae, mesoventral area, mesepisternum, metepisterum, and several mites on the sternites.

Lasioglossum (Chilalictus) bidens sp. nov.

Figures 18D, 52A–H

Material examined. Holotype. ♀, Queensland, Eidsvold (25°22′S, 151°07′E), 11 Oct 1984, IDN & JCC (ANIC).

Paratypes (13♀♀, 3♂♂). Queensland: 1♀, Morven (26°25′S, 147°07′E), 3 Nov 1971, EME, on *Eucalyptus* (UQIC); 3♀♀, Cunnamulla (28°04′S, 145°41′E), 8–19 Oct 1941, A.J. Turner (QM T11690, T11833, T11834).

Victoria: 6♀♀, 3♂♂, Lake Hattah (34°45′S, 142°20′E), 5 Nov 1915, J.E. Dixon, on mallee (NMV; ♀♀ T-15471–15476, ♂♂ T-15477–15479).

Northern Territory: 1♀, Alice Springs (23°42′S, 133°52′E), 15 Aug 1959, EME (UQIC); 1♀, Roe Creek, 12 km SWW of Alice Springs (23°46′S, 133°47′E), 9 Oct 1978, JCC, caught in malaise trap (ANIC); 1♀, 56 km SE of Alice Springs (24°11′S, 134°01′E), 3 Oct 1978, JCC (ANIC).

Diagnosis. Most like *L. macrops* but inner hind tibial spur a different shape. Both sexes black. Female with frons coarsely punctate, mesoscutum anterior margin bilobed, shining and densely punctate, dorsal surface of propodeum striolate, not defined by carinae, dorsal rim

broadly rounded, inner hind tibial spur with two large rounded teeth, forewings with 1st m-cu interstitial with 1st r-m or just entering third submarginal cell. Male with antennae conspicuously short (FL 1.04 × UID), AS4:AS2+3=0.4, face with plumose hair forming a mat, S2–S4 with long, plumose hair, forewings with 1st m-cu entering third submarginal cell, 2nd r-m weaker than 1st r-m.

Description. Female. Body length 6.31–6.78 mm ($\bar{x}$=6.57 mm, SD=0.16, n=10), head width 1.93–1.97 mm (n=10), forewing length 1.60–1.67 mm ($\bar{x}$=1.63 mm, SD=0.03, n=10). Relative dimensions: HW 100, HL 83–84, UID 66–67, LID 56–57, AOD 21–22, IAD 10–11, OAD 26–27, IOD 19–20, OOD 19–20, CL 20–21, GW 18–19, EW 25–26, SL 38–40, FL 67–69.

Structure. Head broad, inner orbits converging below, median frontal carina not reaching median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.37 × LID), convex, surface dull, covered with a fine reticulate pattern, indistinctly punctate, basally with several broad, shallow, irregularly shaped punctures, anteriorly with smaller, rounded punctures, supraclypeal area almost flat, weakly projected near antennal insertion points, densely punctate with small, rounded punctures. Frons (fig. 52A) coarsely punctate above antennal bases, punctures not aligned to form striae, sculpture laterally weakens, extends vertically to posterior margin of lateral ocelli. Labrum (fig. 52B) basal median area raised, nodulated with well separated nodules, anterior margin rounded mesially, distal process not tapered, widest at base although almost parallel-sided, median keel extends to distal margin although highest at midpoint and tapers to distal margin, lateral ridges as small basal processes recurved towards midline, setae not present across distal margin, distal setae originate submarginally, lateral teeth small, not distally hooked. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 52C) anterior margin well projected mesially, distinctly bilobed, punctation conspicuously coarse, anteriorly impunctate and dull, remainder shining and densely punctate, punctures almost contiguous in parapsidal areas. Scutellum 1.3 × longer than dorsal surface of propodeum, shining, sparsely to openly punctate except densely punctate along midline. Dorsal surface of propodeum (fig. 52C) not defined by carinae, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture striolate except with a few interconnectives mesially, dorsal rim broadly rounded, lateral margins gently sloped, rim with a dull sheen. T1 densely punctate. Mesepisternum and metepisternum finely striate except lower portion of metepisternum smooth. BP rounded; inner hind tibial spur with two large, rounded teeth, distal margin wavy (fig. 18D); forewings with 1st m-cu interstitial with 1st r-m or just entering third submarginal cell.

Colour. Body black except mandibles red-brown apically, basal half of clypeus brown, flagellum light brown underneath, legs and posterior marginal area of tergites brown.

Vestiture. Body sparse, lower paraocular areas with dense, adpressed, plumose hair almost forming a mat, frons with shorter, erect, branched hair, clypeus with a few long, minutely branched hairs, dorsolateral margins of pronotum with dense cover of short hair, mesoscutum a few short, erect hair except a tuft of hair present across posterior margin, mesoventral hair minutely branched, metanotum with mesial tomentum, metasomal tomentum laterally on T2, across T3 and T4.

Description of male. Body length 5.62–5.78 mm ($\bar{x}$=5.70 mm, SD=0.11, n=2), head width 1.74–1.79 mm (n=2), forewing length 1.32–1.36 mm ($\bar{x}$=1.34 mm, SD=0.03, n=2). Relative dimensions: HW 100, HL 80–82, UID 68–69, LID 46–48, AOD 17–18, IAD 11–12, OAD 26–27, IOD 20–21, OOD 19–20, CL 18–19, GW 15–16, EW 31–32, ML 34–35, SL 35–36, FL 70–72.

Structure. Head broad, eyes appear bulbous in dorsal and side views, converging below, with a sparse cover of minute setae, clypeus and supraclypeal area flat and shining, clypeus densely punctate, supraclypeal area openly punctate, clypeus entirely black to dark brown. Antennae conspicuously short (FL 1.04 × UID), AS4: AS2+3=0.4. Remainder of body similar to female except pronotal dorsolateral angles not well projected, mesoscutum densely punctate except mesially with a few closely punctate punctures, dorsal surface of propodeum sculpture ruguloso-striolate mesially, striolate laterally; colour similar to female except metasoma and legs light brown; forewings with 1st m-cu entering third submarginal cell, 2nd r-m weaker than 1st r-m.

Vestiture. Frons, paraocular areas, clypeus and supraclypeal area covered with short, adpressed, plumose hair forming a mat, mesoscutum with a conspicuous hair cover of erect,

branched hair, lateral tomentum on T2 and T3, S2–S4 with long, plumose posteriorly directed hair across sternites, S5 and S6 with short adpressed hair.

Genitalia and associated sterna (figs 52E–H). Gonobase sides slightly flanged basally, gonocoxite without setae, gonostyli long with sparse, short, simple setae, penis valves densely hirsute with long, branched hairs on lateral margins, retrorse lobes setose, well developed, ventral flanges present; S8 median process elongate, tapered apically, with a few setae, S7 median process rounded, glabrous.

Distribution (fig. 52D). Periphery of the arid zone, and a record from Alice Springs.

Etymology. The epithet *bidens* refers to the two teeth on the inner hind tibial spur.

Floral Forage Record. Family visited = 1. Catch total = 2; Myrtaceae (2 catches). Genus visited, *Eucalyptus* (2).

Flight Phenology.

0	0	0	0	0	0	0	1	0	4	2	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The two unique character states of *L. bidens* are the reeurved lateral ridges on the labrum and two large teeth on the inner hind tibial spur.

Lasioglossum (Chilalictus) blighi (Cockerell)

Figures 53A–E

Halictus blighi Cockerell, 1915b: 102.

Halictus bassi Cockerell, 1915b: 102. syn. nov.

Lasioglossum (*Chilalictus*) *blighi*. — Michener, 1965: 175.

Lasioglossum (*Chilalictus*) *bassi*. — Michener, 1965: 175.

Material examined. Holotype of *blighi*. ♂, Tasmania, Mt Wellington (42°54′S, 147°14′E), 15 Jan–6 Feb 1913, 1,300–2,300ft, R.E. Turner 1913-212, BM Type Hym. 17.a.928 (BMNH).

Holotype of *bassi*. ♂, Tasmania, Mt Wellington (42°54′S, 147°14′E), 15 Jan–6 Feb 1913, 1,300–2,300ft, R.E. Turner 1913-212, BM Type Hym. 17.a.927 (BMNH).

Other specimens examined (1♂). Tasmania, National Park.

Diagnosis. Most like *L. dischusum*. Male with body black, clypeus black, antennae long (FL 3.14 × UID), AS4:AS2+3 = 1, frons reticulate, mesoscutum dull, finely microtessellate, mesially sparsely to openly punctate, parapsidal areas densely punctures, dorsal surface of propodeum rugulose, not defined by carina, BP absent; sternal vestiture sparse.

Description of male (female unknown). Body length 5.62–5.78 mm (n = 2), head width 1.46–1.69 mm (n = 2), forewing length 1.46-1.67 mm (n = 2). Relative dimensions: HW 100, HL 87–96, UID 64–70, LID 45–48, AOD 15–16, IAD 13–16, OAD 29–32, IOD 21–24, OOD 19–20, CL 20–22, GW 17–22, EW 29–30, ML 32–36, SL 22–26, FL 190–220.

Structure. Head almost as long as broad, inner orbits converging below, median frontal carina weakly developed, reaching median ocellus. Scape not reaching median ocellus. Clypeus moderately long (CL 0.46 × LID), projecting distinctly below lower margins of eyes, shining on basal half and elosely punctured, remainder microtessellate and impunctate, supraclypeal area not projecting, impunctate, microtessellate. Antennae long (FL 3.14 × UID), AS4: AS2+3 = 1. Frons eoarsely reticulate above antennal bases, sculpture laterally weakly reticulate, extends vertically to lateral ocelli; vertex with transverse striae. Pronotum lateral process rounded, weakly projecting. Mesoscutum dull, finely microtessellate, mesially sparsely to openly punctate with small, rounded punctures, posteriorly and in parapsidal areas densely punctate with larger punctures. Scutellum longer than dorsal surface of propodeum, surfaee dull, densely punctured. Dorsal surface of propodeum not defined by carina, posterovertical carinae reaching halfway to dorsal surface, dorsal surface sculpture rugulose, reaching rim. T1 closely punctured. Mesepisternum relatively smooth, metepisternum with horizontal striae on upper half, remainder smooth. BP absent.

Colour. Body black, clypeus black, mandibles dark red-brown apically, flagellum and legs dark brown except tarsi light brown.

Vestiture. Body sparse, faee and mesoscutum with erect, branched hair, mesoventral area with long, plumose hair, weak metasomal tomentum laterally on T2–T4; sternal vestiture sparse, erect, branched hair on S1–S3 and S4–S5 with adpressed, simple and minutely branched hair.

Genitalia and associated sterna (fig. 53B–E). Gonobase sides slightly narrowed basally, gonocoxal without setae, gonostyli with simple, apical setae only, long setae dorsally, short setae ventrally, retrorse lobes setose, well developed, ventral flanges present; S8 median process short, truncate, weakly bilobed and glabrous, S7 median process rounded and glabrous.

Distribution (fig. 53A). Tasmania.

Floral Forage Record. None available.

Flight Phenology.

2	0	0	0	0	0	0	0	0	0	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Michener's (1965, p. 175) placement of *L. blighi* within the subgenus *Chilalictus* is unusual as the male lacks a hind basitibial plate. This character is more common in other subgenera (e.g. *L. (Parasphecodes)*), although the male genitalia are consistent with those of *Chilalictus*. Association of the female would greatly clarify subgeneric placement. Cockerell (1915e) noted that *L. bassi* was a "variety" of *L. blighi*. I have examined the type material and consider them to be synonymous.

Lasioglossum (Chilalictus) brazieri (Cockerell)

Figures 13A, 54A–H

Halictus brazieri Cockerell, 1916b: 367.

Halictus eboracensis Cockerell, 1918a: 117, syn. nov.

Halictus subetheridgei Rayment, 1953: 23–24, syn. nov.

Lasioglossum (*Chilalictus*) *brazieri*. — Michener, 1965: 175.

Lasioglossum (*Chilalictus*) *eboracense*. — Michener, 1965: 176.

Lasioglossum (*Chilalictus*) *subetheridgei*. — Michener, 1965: 177.

Material examined. Holotype of *brazieri*. ♀, Western Australia, Yallingup (33°39′S, 115°01′E), Nov 1913, R.E. Turner, 1914-190. BM Type Hym 17.a.915 (BMNH, missing right antenna, apical margin of T1 separated from the remainder of tergite.)

Holotype of *eboracensis*. ♀, New South Wales, Ebor (30°24′S, 152°21′E), 30 Dec 1915, 201, A.J. Turner, BM Type Hym 17.a.957 (BMNH, missing last four flagellar segments of left antenna, left hind tarsus except basitarsus).

Syntypes of *subetheridgei* (4♂♂). Victoria: 2♂♂, Emerald (37°56′S, 145°27′E), 1 Jan 1935; 2♂♂, Gorae West (38°15′S, 141°30′E), 10 Nov 1950 (ANIC).

Other specimens examined (71♀♀, 63♂♂). New South Wales and Australian Capital Territory: Mt Kosciusko, Jindabyne, Snowy Mts, Kiandra, Brindabella Ra., Brown Mtn, Mt Tomah, Blue Mts, Clarence, Orange, Cutler Pass, Barrington Tops, Tubrabucca, New England Nat. Pk, Ebor, Barraba Track, Mt Kaputar Track, Glen Innes.

Victoria: Toora, Beech Forest, Gorae West, Dingley, Cheltenham, Emerald, Oakleigh, Sherbrooke, Olinda, St. Albans, Hamilton, Mt Donna Buang, Bacchus Marsh, Kallista, Clarkefield, Macedon, Howqua, Cobungra, Dinner Plain, Grampians, Falls Creek, Mt Buffalo, Echuca.

Tasmania: Adventure Bay, New Town, Ocean Beach, Launceston, Mt Barrow, St Helens, Forthside, Yolla, South Australia: Meningie, Victor Harbour, Goolwa, Adelaide, Birdwood, Williamstown.

Western Australia: Torndirrup Nat. Pk, Augusta, Cape Freycinet, Yallingup.

Diagnosis. Most like *L. repraesentans*. Both sexes with body black. Female with frons coarsely reticulate, labrum median keel spatulate, lateral ridges weak; mesoscutum anterior margin with bilobed mesial projection, punctation moderately coarse, surface shining, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral angular carinae, posterovertical surface plicate, dorsal rim raised, recessed mesially. Male S3 and S4 with dense long plumose hair across posterior margin, S5 with weak lateral tufts; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 8.62–12.01 mm ($\bar{x}$=10.31 mm, SD=0.83, n=20), head width 2.23–2.93 mm (n=20), forewing length 2.33–2.94 mm ($\bar{x}$=2.64 mm, SD=0.15, n=20). Relative dimensions: HW 100; HL 82–85; UID 60–61; LID 55–57; AOD 20–22; IAD 9–10; OAD 23–27; IOD 16–18; OOD 17, CL 21–23; GW 18–20; EW 23–26; SL 41–44; FL 72–73.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocelli (fig. 54A), eyes with short, sparse setae. Scape reaching beyond lateral ocelli. Clypeus short (CL 0.39 × LID) weakly convex, shining except microtessellate anteriorly, punctures irregularly shaped, closely punctate, supraclypeal area distinctly protruded, dull and densely punctured. Frons (fig. 54A) coarsely reticulate above antennal bases less so laterally, sculpture extends to level of anterior margin of to lateral ocelli. Labrum (fig. 54B) basal median area raised, sculpture smooth, distal process not tapered, widest at base, median keel spatulate extends beyond margin, lateral ridges weak not extending to margin, distal margin setose, lateral teeth large, distally hooked. Pronotum dorsolateral angles obtuse, projected. Mesoscutum (fig. 54C) anterior margin with bilobed mesial projection, punctation moderately coarse, surface shining except anteriorly, along midline closely punctate, laterad of midline mesially openly punctate (some specimens with weak, oblique, posteriorly directed striae meeting along midline), parapsidal areas closely punctate. Scutellum 1.4 × longer than dorsal surface of propodeum, dull, median line deeply impressed, densely punctured. Dorsal surface of propodeum (fig. 13A) defined by posterolateral angular carinae set well below dorsal surface, postero-

vertical surface transversely plicate, carinae reach dorsal carinae, dorsal rim raised, recessed mesially, sculpture ruguloso-striolate mesially, laterally striolate, sculpture just reaching rim mesially. T1 densely punctate. Mesepisternum and metepisternum with strong, horizontal striae. BP rounded.

Colour. Body black except mandible apically red-brown, antennae, legs and (in some specimens) metasoma dark brown, mesoscutum with a deep, steel blue tinge.

Vestiture. Body sparse, head and mesoscutum with erect, minutely plumose hair, white tomentum laterally on T2, across T3 and T4.

Description of male. Body length 8.47–10.63 mm ($\bar{x}$=9.12 mm, SD=0.66, n=10), head width 2.39–2.52 mm (n=10), forewing length 2.21–2.77 mm ($\bar{x}$=2.45 mm, SD=0.21, n=10). Relative dimensions: HW 100, HL 84–86, UID 63–64, LID 50–51, AOD 18–19, IAD 12–13, OAD 23–25, IOD 18–19, OOD 18–19, CL 22–23, GW 22–24, EW 28–29, ML 41–43, SL 30–32, FL 117–119.

Structure. Head broad, inner orbits converging below, eyes with sparse, minute setae; scape just reaching lateral ocelli, clypeus flat, densely punctate, anterior half to three-quarters dull yellow, supraclypeal area weakly produced. Antennae moderately long (FL 1.86 × UID), AS4:AS2+3=0.71. Remainder of body similar to female except dorsal surface of propodeum posterolateral carinae weakly developed; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Similar to female, paraocular hair erect. S3 and S4 with dense long plumose hair across posterior margin, S5 with weak lateral tufts.

Genitalia and associated sterna (figs 54E–H). Gonobase sides narrowed basally, gonocoxite setose on apical inner and lateral margins, gonostyli setae long and branched, retrorse lobes setose, well developed, ventral flanges present; S8 and S7 median processes apically rounded, setose with simple setae.

Distribution (fig. 54D). Eastern and western zones of the Bassian province.

Floral Forage Record. Families visited=13. Catch total=27; Boraginaceae (1 catch), Compositae (7), Epacridaceae (1), Fabaceae (1), Iridaceae (1), Liliaceae (1), Myrtaceae (7), Onagraceae (2), Ranunculaceae (2), Rosaceae (1), Rutaceae (1), Thymelaeacae (1), Umbelliferae (1). Genera visited=21; unidentified genus of Compositae (1), *Baeckea* (1), *Boronia* (1), *Brachycome* Cass. (1), *Burchardia* (1), *Calytrix* (1), *Cichorium* L. (1), *Conium* (1), *Cotoneaster* [B. Ehrh.] Medik. (1), *Cynoglossum* L. (1), *Dillwynia* Sm. (1), *Epilobium* L. (2), *Eucalyptus* (3), *Hypochoeris* L. (1), *Leptospermum* (1), *Leucopogon* (1), *Muscari* Mill. (1), *Pimelea* Banhs & Solander (1), *Ranunculus* L. (2), *Senecio* (3), *Watsonia* Boehm. (1).

Flight Phenology.

20	8	2	0	2	0	0	0	11	8	14	10
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Cockerell (1916b) gave the sex of the type of *Halictus brazieri* as male; however, examination of the specimen reveals that it is female.

Lasioglossum (Chilalictus) brochum sp. nov.

Figures 9C, 17A, 55A–D

Material examined. Holotype. ♀, Northern Territory, Waterhouse Range, 39 km SSW of Alice Springs (23°59′S, 133°38′E), 11 Oct 1978, JCC (ANIC).

Paratypes (15♀♀). South Australia: 1♀, Brachina Gorge (31°20′S, 138°34′E), 10 Nov 1987, IDN & JCC (ANIC); 8♀♀, Uro Bluff, 28 mi (45 kms) NNW of Pt Augusta (32°07′S, 137°34′E), 30 Oct 1971, TFH, on *Eremophila longifolia* (SAM); 1♀, N. Middleback Range (33°03′S, 137°09′E), 7–8 Oct 1973, TFH, on *Eremophila alternifolia* (SAM).

Northern Territory: 1♀, 53 km NE of Alice Springs (23°35′S, 134°22′E), 6 Oct 1978, JCC, on *Eremophila* sp (ANIC); 1♀, 10 km NE of Alice Springs (23°37′S, 133°54′E), 6 Nov 1979, IDN, on *Eucalyptus* (ANIC); 1♀, 39 km E of Alice Springs (23°41′S, 134°15′E), 25 Sep 1978, JCC (ANIC); 2♀♀, same data as holotype (ANIC).

Diagnosis. Mandible shape similar to *L. nigropolitum*, but unlike any other species. Female with body black except metasoma light red-brown, frons elongate, striate, labrum basal median area raised forming two tubercles, distal process tapered, mandibles with preapical mandibular tooth forming large, rounded boss, pronotal dorsal lateral angles not projected, mesoscutum dull, closely to densely punctate, dorsal surface of propodeum ruguloso-striolate on basal half only, defined by posterolateral angular carinae.

Description of female (male unknown). Body length 5.08–5.62 mm ($\bar{x}$=5.43 mm, SD=0.17, n=10), head width 1.57–1.65 mm (n=10), forewing length 1.34–1.53 mm ($\bar{x}$=1.43 mm, SD=0.06, n=10). Relative dimensions: HW 100, HL 89–90, UID 60–61, LID 51–52, AOD 20–21, IAD 10–11, OAD 34–35, IOD 20–21,

OOD 11–13, CL 21–22, GW 17–18, EW 27–28, SL 38–39, FL 80–82.

Structure. Head elongate, almost as long as broad, frons elongate, clypeus well projected below lower levels of eyes, inner orbits converging below, median frontal carina reaches median ocellus, although upper portion weak, eyes appear bare though with a few minute setae. Scape just reaches anterior margin of median ocellus. Clypeus short (CL 0.40 × LID), weakly convex, more so ventrally, surface shining except anterior margin dull, basally with several shallow, rounded punctures openly to closely punctate, basally with fine transverse lines, impunctate, supraclypeal area weakly projected mesially shining and closely punctate, around margins dull, impunctate. Frons (fig. 55A) elongate (FL 0.35 × HW), finely striate above antennal bases, striae meet along midline forming V-shaped lines, sculpture laterally weakens to sparsely punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 55B) basal median area raised forming two tubercles, anterior margin rounded mesially, raised to form distinct lip, lateral areas weakly recessed, distal process tapered, widest at base, median keel broad, lateral ridges large, gently sloped on proximal side, extend to margin, setae not present across distal margin, lateral teeth absent. Mouthparts with preapical mandibular tooth grossly enlarged, forming large, rounded boss (fig. 9C). Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 55C) anterior margin rounded, punctation fine, surface dull, covered with fine lineolation, anteriorly impunctate, remainder closely to densely punctate with small, shallow, rounded punctures. Scutellum length equal to dorsal surface of propodeum length, surface shining, sparsely punctate except along midline dull with fine longitudinal lines. Dorsal surface of propodeum (fig. 55C) defined by weak posterolateral angular carinae set well below dorsal level, posteroventical carinae reach dorsal carinae, dorsal sculpture weak, ruguloso-striolate on basal half only, lateral margins smooth, dorsal rim rounded, with dull sheen. T1 densely punctate except posterior marginal area punctation reduced, mesepisternum and metepisternum smooth. Fore tibial spur comb shaped (fig. 17A); BP rounded.

Colour. Head and mesosoma black, metasoma light red-brown, mandibles light amber except apically dark red-brown, antennae brown above, light brown underneath, legs brown except fore and mid tibiae and tarsi light brown.

Vestiture. Body sparse, paraocular areas with erect branched hair, frons almost bare, mesoscutum with short, semi-erect, branched hair almost forming a mat across posterior margin.

Distribution (fig. 55D). Eyrean, known at present from Port Augusta to Alice Springs.

Etymology. The epithet *brochum* means "projecting tooth" and refers to the shape of the mandibles.

Floral Forage Record. Families visited=2. Catch total=4; Myoporaceae (3 catches), Myrtaceae (1). Genera visited=2; *Eremophila* (3), *Eucalyptus* (1).

Flight Phenology.

1	0	0	0	0	0	0	0	1	4	2	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum brochum and *L. nigropolitum* are non-metallic, yet they share a number of labrum characters that are more usually associated with metallic species, although only *L. brochum* has an elongated frons. The female of *L. nigropolitum* has macrocephalic development which may be associated with a wood-nesting habit. The unusual character shared by these two species is the enlarged pre-apical tooth on the mandible.

Lasioglossum (Chilalictus) brunnesetum sp. nov.

Figures 23A, 26A, 56A–H

Material examined. Holotype. ♀, Queensland, 4 mi (6.4 kms) W of Paluma (19°00′S, 146°10′E), 3,000ft, 13 Apr 1969, I.F.B. Common & M.S. Upton (ANIC).

Paratypes (14♀♀, 1♂). Queensland: 14♀♀, Paluma (19°00′S, 146°12′E), Aug 1966, JCC, on *Helichrysum rupicola* (UQIC); 1♂, same data as holotype (ANIC).

Other specimens examined (77♀♀, 62♂♂). Queensland: Amiens, Mt Nebo, Bunya Mts.

New South Wales and Australian Capital Territory: Nadgee Reserve, Bondi State Forest, Snowy Mts, Brindabella Ra., Blue Mts Nat. Pk.

Victoria: Dromana, Gorae West, Nelson, Beaumaris, Walhalla, Sandringham, Belgrave, Ferntree Gully, Bayswater, Melbourne, Woori Yallock, Mt Evelyn, Seville, Millgrove, Healesville, Noorinbee, Bendigo, Mt Buffalo.

Tasmania: Southport, Eaglehawk Neck, Kingston, The Lea, Hobart, Weldborough, Gladstone.

South Australia: Athelstone, Kangaroo Island, Belair, Mt Lofty.

Diagnosis. Brown vestiture on mesoscutum not found on any other species. Both sexes black. Female with frons striate, mesoscutum covered with short brown setae, densely punctate, dorsal surface of propodeum weakly ruguloso-striolate

mesially, remainder striolate. Male with antennae moderately long (FL 2.0 × UID), AS4: AS2+3=1, mesoventral area with two small, apically pointed, posteriorly directed processes, S2 mesially with small, rounded process, S2 and S3 with dense, slightly curved, plumose hair; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 4.85–6.04 mm ($\bar{x}$=5.39 mm, SD=0.35, n=10), head width 1.57–1.79 mm (n=10), forewing length 1.32–1.57 mm ($\bar{x}$=1.46 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 82–83, UID 63–65, LID 52–55, AOD 20–21, IAD 11–12, OAD 30–32, IOD 16–18, OOD 17–18, CL 17–18, GW 15–16, EW 25–26, SL 36–38, FL 65–69.

Structure. Head broad, inner orbits converging below, median frontal carina reaches about half way to median ocellus, eyes with sparse cover of minute setae. Scape reaching at least anterior margin of median ocellus. Clypeus short (CL 0.33 × LID), convex on basal half, surface shining, mesially closely to densely punctate with large, deeply impressed punctures, laterally smooth, almost impunctate, anteriorly dull, indistinctly openly punctate, supraclypeal area projected, shining openly punctate. Frons (fig. 56A) striate above antennal bases, striae meet basally along frontal carina, sculpture laterally weakens to smooth along inner orbits, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 56B) median basal area raised forming two tubercles, anterior margin mesially rounded, distal process not tapered, widest at base, medial keel extends well beyond distal margin, lateral ridges weak, extend to margin, distal margin setose, lateral teeth small, not hooked. Pronotum dorsolateral angles bluntly obtuse, moderately projected. Mesoscutum (fig. 56C) anterior margin rounded, punctation moderately coarse, surface with a dull sheen, anteriorly dull, impunctate, remainder densely punctate, punctures along midline and parapsidal areas contiguous, mesially with small interspaces. Scutellum 1.4 × longer than dorsal surface of propodeum, surface shining, densely punctate. Dorsal surface of propodeum (fig. 56C) not defined by carinae, posterovertical carinae extends less than halfway to dorsal level, dorsal sculpture weak, ruguloso-striolate mesially, laterally striolate, sculpture on basal half to two-thirds, remainder dull, surface with fine alveolate pattern, rim rounded. T1 densely punctate. Mesepisternum and metepisternum almost smooth, a few fine striae on upper half. BP rounded.

Colour. Body black except mandibles red-brown apically, antennal flagellum brown underneath, mesoscutum with brown colour due to cover of short brown hair, metasoma with posterior marginal areas and legs brown.

Vestiture. Body sparse, frons and paraocular areas with long, semi-adpressed, branched hair not forming a mat, mesoscutum with conspicuous cover of short, brown, minutely branched setae, mesoventral hair minutely branched, metasomal tomentum laterally on T2 and T3.

Description of male. Body length 3.39–4.62 mm ($\bar{x}$=4.14 mm, SD=0.41, n=10), head width 1.18–1.53 mm (n=10), forewing length 0.94–1.34 mm ($\bar{x}$=1.72 mm, SD=0.12, n=10). Relative dimensions: HW 100, HL 82–84, UID 63–65, LID 44–45, AOD 15–16, IAD 15–16, OAD 29–30, IOD 19–20, OOD 18–19, CL 19–20, GW 15–16, EW 30–31, ML 35–38, SL 28–29, FL 129–132.

Structure. Head broad and triangular, inner orbits converging below, eyes with sparse cover of minute setae, clypeus gently convex, shining, with a few, broad shallow depressions, basal half to two-thirds pale yellow, supraclypeal area projected, shining, sparsely punctate. Antennae moderately long (FL 2.0 × UID), AS4: AS2+3=1. Remainder of body similar to female except frons coarsely striate, mesoscutum punctation closely to densely punctate, not contiguous, widest interspaces between mesial punctures, scutellum openly punctate, dorsal surface of propodeum ruguloso-striolate across entire surface, mesoventral area with two widely-separated, apically bluntly-pointed, posteriorly directed processes (fig. 23A), area between processes recessed, S2 with small, median, rounded process (fig. 26A); forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, paraocular areas with short, adpressed, plumose hair forming a weak mat, frons with some plumose hair, mesoscutum with short, erect, branched hair, metasomal tomentum weak laterally on T2 and T3, S2 and S3 with dense, slightly curved, plumose hair across sternite, forming a brush, S4 with similar hair though less dense, S5 and S6 with short, adpressed, simple hair.

Genitalia and associated sterna (figs 56E–H). Gonobase sides parallel to slightly narrowed basally, gonocoxite setose on apical inner margin, gonostyli long, apically enlarged forming broad, convex dome above gonocoxite with cover of simple setae, undersurface of dome with several thickened setose spines, retrorse

lobes setose, well developed, ventral flanges absent, penis valves broad dorsally; S8 median process elongate, apically tapered with keel near apex, with several setae, S7 median process tapered, glabrous.

Distribution (fig. 56D). Eastern zone of the Bassian province.

Floral Forage Record. Families visited=8. Catch total=11; Campanulaceae (2 catches), Compositae (2), Fabaceae (1), Goodeniaceae (1), Labiatae (1), Myrtaceae (2), Pittosporaceae (1), Proteaceae (1). Genera visited=10; *Acacia* (1), *Bursaria* (1), *Eucalyptus* (1), *Hakea* (1), *Helichrysum* (1), *Kunzea* (1), *Prostanthera* Labill (1), *Scaevola* L. (1), *Senecio* (1), *Wahlenbergia* (2).

Flight Phenology.

18	1	2	2	1	0	0	2	2	1	7	9
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Female specimens show a clinal size variation from north to south. The smallest specimen was recorded from Paluma, Queensland (4.85 mm) and the largest from Kingston, Tasmania (6.00 mm). Several males exhibit macrocephalic development through a broadened clypeus, produced and increased genal width, decreased interorbital distance and increased mandibular length.

Lasioglossum (Chilalictus) bubrachium sp. nov.

Figures 27D, 57A–H

Material examined. Holotype. ♀, South Australia, 10 km NNE of Roxby Downs (30°37′S, 136°48′E), 31 Oct 1990, KLW, on *Hakea* (NMV T-15480).

Paratypes (1♀, 55♂♂). New South Wales, 44♂♂, 20 km W of Cobar (31°30′S, 145°40′E), 30 Oct 1983, KLW, on *Eucalyptus* (NMV T-15481–15524).

Victoria, 1♂, 20 mi SE of Mildura (34°18′S, 142°16′E), 5 Jan 1967, TFH, on *Eucalyptus* (SAM).

South Australia: 7♂♂, same data as holotype (NMV T-15525–15531); 1♂, 30 km SE of Pimba (31°23′S, 136°56′E), 2 Nov 1990, KLW, on *Hakea* (NMV T-15532); 1♀, 29 km NNW of Pt Augusta (32°15′S, 137°46′E), 29 Sep 1972, TFH, on myall flower (SAM); 1♂, Lake Gilles (32°56′S, 136°46′E), 27 Oct 1974, C.A. & TFH, on *Eremophila scoparia* (SAM); 1♂, 30 km SW of Whyalla (33°17′S, 137°33′E), 3 Nov 1990, KLW, on *Atalaya hemiglauca* (NMV T-15533).

Diagnosis. Most like *L. biceps*. Female with body black, frons striate, pronotal dorsolaterally rounded, not projected, mesoscutum punctation fine, surface dull, sparsely to openly punctate, dorsal surface of propodeum ruguloso-striolate weakly defined by posterolateral carinae, fore tibial spur fan-shaped. Male with antennae moderately long (FL 2.32 × UID), fore femora underneath with enlarged boss basally, lower face with dense hair mat, S2 with hair extending to lateral margins, S3 and S4 with posterolaterally directed hair, S5 with posteromesially directed hair, forewings with 2nd r-m as weaker than 1st r-m.

Description of female. Body length 4.77–5.39 mm ($\bar{x}$=5.08 mm, SD=0.44, n=2), head width 1.36–1.38 mm (n=2), forewing length 1.43–1.48 mm ($\bar{x}$=1.46 mm, SD=0.02, n=2). Relative dimensions: HW 100, HL 94–96, UID 59–60, LID 57–58, AOD 20–22, IAD 10–11, OAD 32–33, IOD 26–27, OOD 12–13, CL 23–24, GW 18–19, EW 24–25, SL 40–42, FL 82–84.

Structure. Head elongate, inner orbits slightly converging below, median frontal carina reaches median ocellus, upper portion of carina weak, eyes with sparse cover of minute setae. Scape just reaches anterior margin of median ocellus. Clypeus mostly projected below lower level of eyes, short (CL 0.41 × LID), flat except weakly convex ventrally, basal half with a dull sheen, openly to sparsely punctate with small shallow punctures, anteriorly dull, covered with fine, reticulate pattern, impunctate, supraclypeal area almost flat, dull and covered with fine reticulate pattern, with a few indistinct punctures. Frons (fig. 57A) striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 57B) basal median area raised, weakly ridged, anterior margin bluntly obtuse mesially, weakly raised to form lip, anterolateral corners angular, distal process not tapered, widest at base, median keel extends beyond distal margin, lateral ridges small, not extending to margin, setae not present across distal margin, lateral teeth small, distally hooked. Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 57C) anterior margin rounded, punctation moderately fine, surface dull and covered with fine reticulate pattern, anteriorly impunctate, remainder sparsely to openly punctate with small, shallow, rounded punctures. Scutellum length equal to dorsal surface of propodeum length, surface dull, except two small areas shining on either side of midline, openly punctate. Dorsal surface of propodeum (fig. 57C) weakly defined by posterolateral carinae set well below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal sculpture ruguloso-striolate, not reaching dorsal rim, rim with a dull sheen. T1 densely

punetate, exeept posterior marginal area almost impunetate, with transverse lines. Mesepisternum and metepisternum striate on upper half, remainder smooth. Fore tibial spur fan-shaped; BP rounded.

Colour. Body blaek exeept, mandibles red-brown apieally, antennae brown, tergites with posterior marginal areas brown, fore and mid tibiae and tarsi light red-brown, remainder of legs brown.

Vestiture. Body sparse, a few long branehed hairs in paraocular areas, clypeus almost bare, frons with short hair and a few longer branched hairs, mesoscutum with short, ereet branched hair, weak tomentum laterally on T2, aeross T3 and T4.

Description of male. Body length 4.16–5.16 mm ($\bar{x}$=4.74 mm, SD=0.36, n=10), head width 1.25-1.43 mm (n=10), forewing length 1.13–1.34 mm ($\bar{x}$=1.26 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 84–86, UID 60–61, LID 48–49, AOD 16–17, IAD 11–13, OAD 30–31, IOD 26–28, OOD 12–13, CL 18–20, GW 16–17, EW 31–32, ML 36–37, SL 32–34, FL 140–142.

Structure. Head elongate, inner orbits converging below, eyes appear bulbous in frontal view, with sparse cover of minute setae, elypeus shining, appears impunctate, pale yellow on basal half, supraclypeal area flat, with a dull sheen. Antennae moderately long (FL 2.32 × UID), AS4:AS2+3=1. Remainder of body similar to female but with mesoscutum shining exeept dull along midline, surfaee openly to elosely punetate, scutellum highly polished almost impunctate, dorsal surface of propodcum posterolateral carinae present though weak, dorsal rim shining; body black except clypeus as noted, flagellum light brown underneath, metasoma brown with posterior marginal area light brown, legs with apical portion of femora, fore, mid and hind tibiae and tarsi light red-brown, fore femora underneath with enlarged boss, apieally surface smooth, broad and slightly concave (ef. fig. 19E); forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower frons, paraeeular areas, clypeus and supraelypeal area with short, adpressed, plumose hair forming a mat, fore coxae with dense hair, remainder similar to female exeept lateral tomentum just present on T2 and T3; S2 with semi-erect branehed hair extending to lateral margins, S3 and S4 with short, branehed adpressed posterolaterally directed hair, S5 and S6 with short, simple, adpressed, posteromesially direeted hair (fig. 27D).

Genitalia and associated sterna (figs 57E–H). Gonobase sides narrowed basally, gonoeoxite without setae, gonostyli long, apically swollen, with a few short setae and several large thickened spine-like setae, retrorse lobes setose, not well developed, ventral flanges absent, stout setae apieally, distal arm of lobe redueed to glabrous, narrowed process that projeets almost to midline; S8 median proeess elongate, apically truneate and bilobed, with a few short, simple setae, S7 median process rounded.

Distribution (fig. 57D). Southeastern South Australia and western New South Wales.

Etymology. The epithet *bubrachium* means "big forearm" and refers to the enlarged fore femora of males.

Floral Forage Record. Families visited=5. Catch total=7; Fabaeeae (1 eateh), Myoporaceae (1), Myrtaceae (2), Proteaceae (2), Sapindaceae (1). Genera visited=5; *Acacia* (1), *Atalaya* (1), *Eremophila* (1), *Eucalyptus* (2), *Hakea* (2).

Flight Phenology.

1	0	0	0	0	0	0	0	1	3	2	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. See *Remarks* for *L. biceps*. The holotype has more than 40 hypopial nymphal mites on the paraocular and supraclypeal areas, clypeus, dorsal surfaee of pronotum, basal area of T1 and mesoventral area just behind the fore coxae.

Lasioglossum (Chilalictus) bucculum sp. nov.

Figures 5E–H, 9F, 21B, 58A–H

Material examined. Holotype. ♀, South Australia, 10 km S of Port Germein (33°05′S, 138°00′E), 6 Nov 1990, KLW, on *Nitraria billardieri* (NMV T-15534).

Paratypes (23♀♀, 28♂♂). Queensland, 17♀♀, 20♂♂, Dynevor Lakes, 88 km W of Eulo (28°05′S, 144°12′E), 24–28 Sep 1991, G. Daniels & G. Maynard, on *Eremophila sturtii* (UQIC).

Victoria, 1♀, Lake Tyrrell (35°23′S, 142°50′E), 21 Nov 1975, K.R. Norris (ANIC).

South Australia: 1♂, 30 km SE of Pimba (31°23′S, 136°56′E), 2 Nov 1990, KLW, on *Hakea* (NMV T-15535); 1♂, 80 km SE of Pimba (31°35′S, 137°08′E), 2 Nov 1990, KLW, on *Atalaya hemiglauca* (NMV T-15536); 1♀, 5♂♂, 5 km SSE of Port Germein (33°03′S, 138°02′E), 29 Apr 1978, JCC (ANIC); 3♀♀, 1♂, same data as holotype (NMV; ♀♀ T-15538–15540, ♂, T-15537).

Western Australia, 1♀, 6 km NW of Johnson Rocks

(29°46′S, 119°46′E), 23 Sep 1982, B. Hanich & TFH, on flowers of *Velleia rosea* (WAM 87/246).

Diagnosis. Macrocephalic development unlike any other species. Both sexes black, macrocephalic, in particular on vertex and genae; mesoscutum shining, dorsal rim of propodeum not defined by carinae, smooth, shining, rounded; proboscis variously elongated. Ratio to HW (mean (SD), n=5): GL 0.45 (0.01) female, 0.48 (0.01) male; LPL 0.25 (0.01) female, 0.26 (0.01) male; MPL 0.34 (0.02) female, 0.40 (0.01) male; PML 0.75 (0.02) female, 0.76 (0.01) male.

Description of female. Body length 7.47–8.47 mm ($\bar{x}$=7.97 mm, SD=0.28, n=14), head width 2.21–2.56 mm ($\bar{x}$=2.36 mm, SD=0.11, n=14), forewing length 1.86–2.04 mm ($\bar{x}$=1.93 mm, SD=0.07, n=14). Relative dimensions: HW 100, HL 89–97, UID 64–65, LID 65–67, AOD 21–22, IAD 12–15, OAD 28–29, IOD 18–19, OOD 18–19, CL 20–21, GW 27–28, EW 23–24, SL 39–40, FL 62–63.

Structure. Head (figs 5E, 5F, 9F) 0.92 × longer than wide, inner orbits parallel to slightly converging below, median frontal carina not reaching midway to median ocellus, eyes sparsely covered with minute setae, scape reaching at least posterior margin of lateral ocelli. Clypeus broad, in side view, continues contours of supraclypeal area, not produced downwards, half lies below lower ends of eyes, clypeus and supraclypeal surface smooth, shining, irregularly punctured, punctures separated by less than diameter of puncture to twice diameter of puncture; proboscis variously elongated (fig. 5E), comparison to HW (mean (SD), n=5), GL 0.45 (0.01), LPL 0.25 (0.01), MPL 0.34 (0.02), PML 0.75 (0.02); glossa densely hirsute; palpi not structurally modified. Frons (fig. 58A) elongate 0.29 × HW, coarsely punctate above antennal bases and to inner margins of orbits and lower paraocular areas, puncture aligned forming costulate pattern, sculpture extends to beyond posterior margin of lateral ocelli, vertex (fig. 58A) broadened, 0.34 × HW, sculptured with several weak, transverse plicae (fig. 9F). Labrum (fig. 58B) basal area well defined, lateral depression present, lateral margin curved dorsally, median area forming large, raised boss, concave mesially, distal process broad, widest at base, lateral margins with few small teeth basally, remainder smooth, distal setae originate in from margin, remainder originate on margin, distal margin sinuate, setae absent, weak median keel present, extending halfway to distal margin, weak lateral ridges present, similar length to median keel. Pronotum dorsolateral acute forming small projection, vertical pronotal surface with several prominent ridges extending length of surface. Mesoscutum (fig. 58C) narrower than HW, anterior margin, in side view, not extending over pronotum, in dorsal view, distinctly bilobed, punctation moderately coarse, anteriorly impunctate, surface dull, remainder of surface shining, along midline and in parapsidal areas densely punctured, punctures either contiguous or separated by less than diameter of puncture, mesially punctures separated by least diameter of mesoscutal punctation to twice diameter of puncture. Scutellum 1.4 × longer than dorsal surface of propodeum length, surface smooth, shining, impunctate except few sparse, minute punctures. Dorsal surface of propodeum (fig. 58C) not defined by carina, posterovertical carinae extending halfway to dorsal surface, sculpture ruguloso-striolate mesially, striolate laterally, sculpture not reaching dorsal rim, rim rounded, smooth, shining. T1 densely punctured, except smooth, almost impunctate bands extends across tergite basally. Mesepisternum and metepisternum costulate. BP large, apically rounded. Forewings with first recurrent vein institutial with first cubital or enters second submarginal cell.

Colour. Head and mesosoma black except scape and flagellum above dark brown, flagellum light brown below, legs and metasoma light brown in some specimens, dark brown in other specimens, apical margins of tergites amber.

Vestiture. Head with distinct cover of plumose hair, frons hair semi-erect, paraocular areas hair adpressed, clypeus and supraclypeal area almost bare though with a few simple, erect hairs, mesoscutum sparsely covered with erect, branched hair, dense along posterior margin, a few long, plumose hairs on laterovertical surface of propodeum, tomentum present laterally on T2, across tergite on T3 and T4.

Description of male. Body length 5.70–6.70 mm ($\bar{x}$=6.16 mm, SD=0.36, n=17), head width 1.69–1.90 mm (n=17), forewing length 1.46–1.64 mm ($\bar{x}$=1.53 mm, SD=0.05, n=17). Relative dimensions: HW 100, HL 94–97, UID 67–71, LID 59–69, AOD 19–21, IAD 13–15, OAD 27–28, IOD 19–20, OOD 20–21, CL 20–21, GW 25–30, EW 27–28, ML 50–55, SL 35–36, FL 87–90.

Structure. Head elongate (figs 5G, H), 0.97 as long as wide; eyes converging below; sculpture similar female except weaker; proboscis modified (fig. 5G), measurements compared to HW

(mean (SD) n=5), GL 0.48 (0.01), LPL 0.26 (0.01), MPL 0.40 (0.01), PML 0.76 (0.01); labrum modified, distal process enlarged (fig. 21B). Antennae moderately long, flagellum 1.26 × UID, flagellar segments as wide as long, antennal segment 4 shorter than segments 2+3 (AS4:AS2+3=12:15). Remainder of body similar to female but with mesoscutum densely punctured anteriorly, punctures separated by less than diameter of puncture, area between parapsidal lines smooth and shining, punctation similar to female; scutellum shining; propodeal rim smooth and shining; colour similar to female except metasoma of some specimens almost black, clypeus ochroleucus on basal half; forewing with 2nd r-m as strong as 1st r-m.

Vestiture. Head with dense cover of white, adpressed, plumose hair in paraocular areas and lower frons, upper frons with semi-erect simple hair; remainder similar to female except T2 tomentum lateral only. Sternal vestiture without distinctive pattern, all sterna with long hairs across sternite, longest on S2 hair and plumose along entire length, S3 and S4 distally plumose only, S5 simple.

Genitalia and associated sterna (figs 58E–H). Gonobase sides weakly flanged basally, gonocoxite without setae, gonostyli long, with both branched and simple setae, retrorse lobes weakly setose, ventral flanges well developed; S8 and S7 median processes elongate and distally rounded distally, S8 median process with a few simple setae.

Distribution (fig. 58D). Southern half of the Eyrean province.

Etymology. The epithet *bucca* means "cheek" and refers to the prominent genae of this species.

Floral Forage Record. Families visited=5. Catch total=5; Goodeniaceae (1 catch), Myoporaceae (1), Proteaceae (1), Sapindaceae (1), Zygophyllaceae (1). Genera visited=5; *Atalaya* (1), *Eremophila* (1), *Hakea* (1), *Nitraria* L. (1), *Velleia* Sm. (1).

Flight Phenology.

0	0	0	1	0	0	0	0	1	0	4	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Both sexes exhibit macrocephalic development and clinal variation (males more so), with Queensland specimens smaller than southern specimens. (Queensland specimens: body length ♀=7.47–8.24 mm ($\bar{x}$=7.77 mm, SD=0.28, n=10), ♂=5.70–6.47 mm ($\bar{x}$=5.92 mm, SD=0.24, n=10); head width ♀=2.21–2.47 mm ($\bar{x}$=2.30 mm, SD=0.08, n=10), ♂=1.69–1.90 mm ($\bar{x}$=1.78 mm, SD=0.08, n=10); forewing length ♀=1.86–2.02 mm ($\bar{x}$=1.91 mm, SD=0.05, n=10), ♂=1.46–1.62 mm ($\bar{x}$=1.52 mm, SD=0.04, n=10). Southern specimens: body length ♀=7.93–8.47 mm ($\bar{x}$=8.18 mm, SD=0.28, n=4), ♂=6.24–6.70 mm ($\bar{x}$=6.51 mm, SD=0.16, n=7); head length ♀=2.28–2.56 mm ($\bar{x}$=2.42 mm, SD=0.11, n=4), ♂=1.74–2.12 mm ($\bar{x}$=1.93 mm, SD=0.12, n=7); forewing length ♀=1.88–2.04 mm ($\bar{x}$=1.95 mm, SD=0.03, n=4), ♂=1.46–1.64 mm ($\bar{x}$=1.55 mm, SD=0.06, n=7)).

Two specimens have hypopial nymphal mites attached. The holotype has one mite on the anterior margin of the mesoscutum, the other on T1. One male specimen has two hypopial nymphal mites on S1.

Only large-headed morphs of both sexes have been collected. The other known species with similar morphs is *L. megacephalum.*

Lasioglossum (Chilalictus) bullatum sp. nov.

Figures 23B, 59A–E

Material examined. Holotype. ♂, Western Australia, Buningonia Spring (well) (31°26′S, 123°33′E), 18–25 Nov 1978, TFH et al, 225-9, resting on *Triodia* flower stalks, 4pm (WAM 87/76).

Paratypes. 5♂♂, same data as holotype (WAM 87/73–5, 87/77, 87/78, 74 and 78 missing head.)

Other specimens examined (1♀). Western Australia, Hyden.

Diagnosis. Unlike any other species, male with a unique mesoventral processes. Male with body black, antennae moderately long (FL 1.54 × UID), AS4:AS2+3=1, mesoventral area with two elongate, apically pointed, well separated processes, S2 and S3 with long, erect, posteriorly directed, plumose hair, S4 with shorter similar hair, forewings with 2nd r-m weaker than 1st r-m; BP rounded.

Description of male (female unknown). Body length 4.31–4.47 mm ($\bar{x}$=4.41 mm, SD=0.07, n=5), head width 1.50–1.57 mm (n=5), forewing length 1.10–1.20 mm ($\bar{x}$=1.16 mm, SD=0.04, n=5). Relative dimensions: HW 100, HL 84–85, UID 68–70, LID 51–52, AOD 19–20, IAD 13–14, OAD 26–27, IOD 20–21, OOD 21–22, CL 20–21, GW 17–18, EW 29–30, ML 38–40, SL 27–28, FL 106–108.

Structure. Head broad, inner orbits converging below, median frontal carina well developed, reaches median ocellus, eyes with sparse though

conspicuous cover of minute setae. Antennae moderately long (FL 1.54 × UID), AS4: AS2+3=1. Scape not reaching median ocellus. Clypeus weakly convex, entire surface highly polished, basally indistinctly punctate with shallow punctures, anteriorly closely to densely punctate, basal third pale yellow, supraclypeal area flat, shining, indistinctly sparsely punctate. Frons punctate above antennal bases, punctures not aligned to form striae, sculpture lateral weakly punctate, extends vertically to anterior margin of lateral ocelli. Pronotum dorsolaterally rounded, well projected. Mesoscutum anterior margin rounded, surface shining, punctation moderately coarse, anteriorly with weak transverse lineolation and impunctate, openly punctate mesially, closely to densely punctate in parapsidal areas; mesoventral area with two elongate, apically pointed processes set at right angles to body (fig. 23B), process well separated by distance greater than 2 × IAD. Scutellum 1.2 × longer than dorsal surface of propodeum, surface polished, impunctate, appear slightly bulbous. Dorsal surface of propodeum not defined by carinae, posterovertical carinae extend less than halfway to dorsal level, dorsal sculpture ruguloso-striolate with a few striae laterally, sculpture not reaching dorsal rim, rim smooth, highly polished, curves gently to vertical surface. Metasomal T1 densely punctate. Mesepisternum and metepisternum shining, finely striate. Forewings with 2nd r-m weaker than 1st r-m; BP rounded.

Colour. Body black except clypeus as noted, mandibles pale yellow with red-brown tips, antennal flagellum light brown underneath, metasoma with posterior marginal areas suffused with brown, legs brown with tibiae apically and basally and tarsi light pale amber.

Vestiture. Lower frons, paraocular areas, supraclypeal area and upper portion of clypeus with short, adpressed, plumose, white hair forming a mat, mesoscutum with moderate cover of erect, branched hair, metasomal tomentum laterally on T2 and T3, S2 and S3 with long, erect, posteriorly directed, plumose hair, S4 with shorter similar hair, S5 with shorter, adpressed, minutely plumose hair, mesial hair weakly posterolaterally-directed, S6 with adpressed, simple hair.

Genitalia and associated sterna (figs 59B–E). Gonobase sides weakly flanged basally, gonocoxite without setae, gonostyli long, apically broadened, with cover of short setae except dorsal inner margin with several large, thickened spines, retrorse lobes setose, moderately well developed, ventral flanges absent, penis valves flanged on inner and outer margins; S8 median process elongate, tapered, apically setose and rounded, S7 median process short, rounded, glabrous.

Distribution (fig. 59A). South central Western Australia.

Etymology. The epithet *bullatum* means "with knobs" and refers to the mesoventral area processes.

Floral Forage Record. None available.

Flight Phenology.

0	0	0	0	0	0	0	0	0	0	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The specimens, collected in the late afternoon resting on *Triodia* stalks, were probably a sleeping roost of males. Based on similar mesoscutal sculpture patterns, I have tentatively associated a single female specimen with these males (118 km E of Hyden on Norseman road, 24 October 1985, TFH, on *Grevillea hookerana* WAM/87-638), but have not included it in the types series.

Lasioglossum (Chilalictus) caesium sp. nov.

Figures 60A–D

Material examined. Holotype. ♀, Western Australia, ca. 7 km NW of Hammersley Inlet (33°57′S, 119°54′E), 26 Nov 1979, TFH & A. Chapman 292-1, on flowers of *Isopogon tribolus* (WAM 87/109, missing right antenna.)

Paratypes (6♀♀). Western Australia: 1♀, 3 km W of Mt Ragged (33°27′S, 123°29′E), 22 Oct 1982, C.A. Howard & TFH, 496-4, on flowers of *Hakea ?nitida* (WAM 87/255); 3♀♀, same data as holotype (WAM 87/106–108); 1♀, Porongurups (34°42′S, 117°53′E), 9–10 Dec 1970, G.A. Holloway, ex malaise trap (AM); 2♀♀, Torndirrup Nat. Pk, 9 km S Albany (35°10′S, 117°50′E), 25 May–9 Nov 1983, P.H. Dyer & J. Lyon, ex pitfall trap (WAM 90/187, 90/199).

Diagnosis. Metasomal colour unlike any other species. Female with body black except mesoscutum and T1–T4 with distinct blue hue, frons coarsely roughened, scabrous to areolate, labrum with distal setae originating in from margin, mesoscutum dull, densely punctate in parapsidal areas, closely punctate mesially, dorsal surface of propodeum ruguloso-striolate, defined weakly by posterolateral carinae.

Description of female (male unknown). Body length 7.01–1.47 mm ($\bar{x}$=7.25 mm, SD=0.15, n=7), head width 2.14–2.28 mm (n=7), fore-

wing length 1.76–1.95 mm ($\bar{x}$=1.88 mm, SD=0.07, n=7). Relative dimensions: HW 100, HL 75–77, UID 61–62, LID 54–55, AOD 20–21, IAD 09–10, OAD 24–25, IOD 17–18, OOD 16–17, CL 20–21, GW 16–17, EW 24–25, SL 38–40, FL 62–65.

Structure. Head distinctly broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaching anterior margin of lateral ocelli. Clypeus short (CL 0.38 × LID), convex, surface dull, roughly sculptured with large, deeply impressed punctures over entire surface, densely punctate, supraclypeal area projected, dull, densely punctate. Frons (fig. 60A) coarsely roughened, scabrous to areolate above antennal bases, sculpture distinctly raised above general surface, sculpture laterally weakens to reticulate, extends vertically onto vertex. Labrum (fig. 60B) basal median area raised, surface smooth except weakly ridged anteriorly, anterior margin rounded, lateral areas weakly recessed, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges absent, setae present across margin, setae originating submarginally, lateral teeth absent. Pronotum dorsolateral angles acute, moderately projected. Mesoscutum (fig. 60C) anterior margin rounded, surface dull, covered with fine anastomosed pattern, punctation moderately coarse, anteromesially impunctate, with fine transverse lincolation, anterolaterally weakly plicate, densely punctate along midline and in parapsidal areas, closely punctate mesially. Scutellum 1.3 × longer than dorsal surface of propodeum, surface dull, closely to densely punctate except small mesial area openly punctate. Dorsal surface of propodeum (fig. 60C) weakly defined by posterolateral carinae set well below dorsal level, posterovertical carinae extends at least halfway to dorsal carinae, dorsal sculpture rugulosostriolate, striolate laterally, sculpture extends to dorsal rim, rim bluntly angular. T1 densely punctate. Mesepisternum and upper portion of metepisternum coarsely striate, lower portion smooth. BP rounded.

Colour. Body black except mandibles red-brown apically, antennae brown above, light brown underneath, legs tinged with brown, mesoscutum and especially T1–T4 with distinct blue hue.

Vestiture. Body sparse, frons and paraocular areas with erect, branched hair, clypeus with a few minutely branched hairs, mesoscutum with sparse cover of small erect branched hair, tomentum lateral on T2, across T3 and T4.

Distribution (fig. 60D). Coastal region of southern Western Australia from Albany to Esperance.

Floral Forage Record. Family visited=1. Catch total=2; Proteaceae (2 catches). Genera visited=2; *Hakea* (1), *Isopogon* R.Br. (1).

Flight Phenology.

0	0	0	0	0	0	0	0	0	1	2	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. A strikingly beautiful species with blue metasomal tergites. The frons sculpture is extremely coarse and *L. caesium* is one of the few species in which the distal setae of the labrum do not originate on the margin. Examination of male characters will greatly assist defining the species' affinities. All known specimens have been collected on Proteaceae.

Lasioglossum (Chilalictus) calophyllae (Rayment)

Figures 10F, 61A–H

Halictus calophyllae Rayment, 1935: 709–710.
Lasioglossum (Chilalictus) calophyllae. — Michener, 1965: 175.

Material examined. Holotype. ♀, Victoria, Sandringham (35°57′S, 145°00′E), 10 Feb 1929, T. Rayment, 69c (ANIC, head and foreleg glued to body, missing right fore and hind legs, left hind tibia and tarsi, right side of propodeum broken.)

Other specimens examined (123♀♀, 13♂♂). Queensland: Wallangarra, Amosfield, Stanthorpe.

New South Wales & Australian Capital Territory: Nadgee Reserve, Blundells, Canberra, Bilpin, Rylstone.

Victoria: Lorne, Anglesea, Geelong, Sandringham, Emerald, Lakes Entrance, Ferntree Gully, Toorak, Melbourne, Brisbane Ranges, Cann River, Broadford, Inglewood.

Tasmania: Hobart, Cranbrook.

South Australia: Mt Gambier, Harley, Meningie, Purnong, Port Lincoln, Kimba.

Western Australia: Euela, Grass Patch, Lake King, Salmon Gums, Toolinna Rockhole, Norseman.

Diagnosis. Most like *L. supralucens* differs by dorsal propodeum sculpture and carinal shape and position. Both sexes with body black. Female with frons closely striate, median frontal carina not reaching median ocellus, labrum distal process not tapered, distal margin deeply notched on either side of medial keel, lateral ridges large, serrate, mesoscutum surface shining, densely punctate, scutellum surface shining, weakly concave and densely punctate, length shorter than dorsal surface of propodeum, latter

defined laterally and posteriorly, carinae set well below dorsal level in posterolateral corners and at dorsal level laterally. Male with antennae conspicuously long (FL 2.42 × UID), S2–S4 with rows of long plumose hair across sterna, S8 median process truncate apically; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.85–8.32 mm ($\bar{x}$=7.68 mm, SD=0.48, n=10), head width 2.04–2.42 mm (n=10), forewing length 2.04-2.44 mm ($\bar{x}$=2.29 mm, SD=0.13, n=10). Relative dimensions: HW 100, HL 83–85, UID 57–60, LID 57–58, AOD 21–22, IAD 11–12, OAD 22–24, IOD 17–18, OOD 14–15, CL 19–20, GW 17–18, EW 23–24, SL 42–44, FL 75–77.

Structure. Head broad, inner orbits weakly converging below or in some specimens inner orbits parallel, median frontal carina not reaching median ocellus, eyes with distinct cover of long setae. Scape reaching at least anterior margin of lateral ocelli. Clypeus short (CL 0.34 × LID), weakly convex, surface shining except dull along anterior margin, surface roughened anteriorly with deeply impressed, elliptical, almost contiguous punctures, anteriorly punctures shallow, rounded, closely punctate, supraclypeal area protruded, shining, openly to closely punctate. Frons (fig. 61A) closely striate above antennal bases, lower paraocular areas smooth, upper paraocular areas striate, sculpture continues to posterior margin of lateral ocelli. Labrum (fig. 61B) basal median area slightly raised, anterior margin almost straight, forming recessed areas laterally, distal process not tapered, widest at base, median keel extends well beyond distal margin, distal margin deeply notched on either side of medial keel, setae not present across margin, distal setae distinctly longer than penultimate setae, lateral ridges large, serrate, extend to distal margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles bluntly obtuse, weakly projected. Mesoscutum (fig. 61C) anterior margin with weak median projection, sculpture moderately coarse, surface shining except anteriorly dull, anteriorly with fine lineolation, remainder densely punctate. Scutellum 0.86 × shorter than dorsal surface of propodeum, surface shining, weakly concave and densely punctate along midline, remainder sparsely punctate except densely punctate around margin. Dorsal surface of propodeum (fig. 10F) defined laterally with carinae that extend partially across posterior surface, carinae set well below dorsal level in posterolateral corners and at dorsal level laterally, posterovertical carinae almost extend to dorsal carinae, dorsal sculpture ruguloso-striolate, posterolateral corners smooth, sculpture reaches rim laterally, dorsal rim smooth, rounded onto vertical surface. T1 densely punctate. Mesepisternum and metepisternum on upper half striate, remainder smooth. BP bluntly rounded.

Colour. Body black except mandibles dark red-brown apically, antennal flagellum dark brown underneath, legs brown to dark brown.

Vestiture. Body sparse, face and mesoscutum with short, erect minutely branched hair, metasomal tomentum across T2 and T3.

Description of male. Body length 5.93–6.85 mm ($\bar{x}$=6.34 mm, SD=0.28, n=10), head width 1.67–2.02 mm (n=10), forewing length 1.60–1.95 mm ($\bar{x}$=1.82 mm, SD=0.11, n=10). Relative dimensions: HW 100, HL 83–86, UID 62–64, LID 47–48, AOD 15–16, IAD 16–19, OAD 22–24, IOD 20–21, OOD 17–19, CL 20–21, GW 17–18, EW 29–30, ML 36–38, SL 30–32, FL 153–155.

Structure. Head broad, eyes with conspicuous cover of long hair, converging below, clypeus and supraclypeal area smooth and shining, clypeus openly punctate with indistinct shallow punctures, anterior half with white/pale yellow marking. Antennae conspicuously long (FL 2.42 × UID), AS4:AS2+3=1. Remainder of body similar to female except dorsal surface of propodeum carinae absent, dorsal rim smooth and shining, anterior margin of terga brown, pygidial plate light brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Paraocular areas with short, adpressed, plumose hair though not forming dense mat, frons with erect, simple or weakly branched hair, remainder of body sparse, metasomal tomentum absent, S2–S4 with rows of long, plumose hair across sterna, S5 with short, simple to weakly branched hair.

Genitalia and associated sterna (figs 61E–H). Gonobase sides parallel, gonocoxite with several ventrolateral setae, gonostyli long, outer surface with dense cover of erect plumose hair, inner surface with sparse simple hair, retrorse lobes setose on lower margin only, ventral flanges present and glabrous; S8 median process broadly truncate apically, with weakly branched setae, S7 median process rounded apically, glabrous.

Distribution (fig. 61D). Eastern and western zones of the Bassian province, except in the high rainfall area of south-west Western Australia.

Floral Forage Record. Families visited=2. Catch total=29; Fabaceae (3 catches), Myrtaceae (26). Genera visited=6; *Acacia* (3), *Angophora* (1), *Calytrix* (1), *Eucalyptus* (21), *Kunzea* (1), *Melaleuca* (2).

Flight Phenology.

12	11	1	0	1	0	0	0	3	6	11	7
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The unusual shape and position of the propodeal carina and several other labrum characters are shared with a Western Australian species, *L. supralucens*. Cladistic analysis (in thesis Walker (1994) and paper in prep.) suggests the two species are sister taxa and their known distributions are parapatric. *L. supralucens* occurs only in the high rainfall areas of southwest Western Australia, from which *L. calophyllae* is absent.

Lasioglossum (Chilalictus) cambagei (Cockerell)

Figures 62A–H

Halictus cambagei Cockerell, 1910a: 236.

Lasioglossum (Chilalictus) cambagei. — Michener, 1965: 175.

Material examined. Syntype. ♂, South Australia, Adelaide (34°56′S, 138°36′E), Behr, 2565 (Berlin, genital capsule and last tergite removed and glued to a card; ♀ with similar label data lodged in USNM, R. McGinley, personal communication.)

Other specimens examined (9♀♀, 9♂♂). Queensland: Fletcher, Stanthorpe, Inglewood, Helidon.

New South Wales: Narrabri.

Victoria: Broadmeadows.

South Australia: Adelaide, Alligator Gorge Nat. Pk.

Diagnosis. Mesoscutal colour unlike any other species. Both sexes black, mesoscutum tinged blue. Female with frons striate, mesoscutum with a dull lustre, mesially openly punctate, laterally densely punctate, dorsal surface of propodeum ruguloso-striolate. Male with antennae moderately short (FL 1.52 × UID), AS4: AS2+3=0.8, frons and paraocular areas with adpressed plumose hair forming a mat, S2–S4 with long, plumose, hair across sternites, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.54–7.31 mm ($\bar{x}$=6.89 mm, SD=0.28, n=7), head width 1.93–2.14 mm (n=7), forewing length 1.53–1.74 mm ($\bar{x}$=1.67 mm, SD=0.07, n=7). Relative dimensions: HW 100, HL 77–80, UID 60–61, LID 52–55, AOD 20–21, IAD 12–13, OAD 24–26, IOD 18– OOD 15–17, CL 19–20, GW 16–18, EW 22–24, SL 37–39, FL 60–61.

Structure. Head broad, inner orbits converging slightly below, median frontal carina weak, extends to median ocellus, eyes almost bare, few minute setae present. Scape reaches anterior margin of lateral ocelli. Clypeus short (CL 0.36 × LID), weakly convex, shining, closely punctate with large, deeply impressed punctures except densely punctate along anterior margin with small, rounded punctures, supraclypeal area weakly projected, shining mesially, remainder dull, closely punctured. Frons (fig. 62A) finely striate above antennal bases, sculpture laterally weakens to smooth along inner margins of orbits, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 62B) basal median area raised, surface smooth though with irregularly shaped grooves, anterior margin rounded, distal process not tapered, widest at base, median keel extends beyond distal margin, lateral ridges weak, extend to distal margin, setae not present across margin, lateral teeth large, not distally hooked. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 62C) anterior margin not projected though weakly bilobed mesially, punctation moderately coarse, surface with a dull lustre, anteriorly impunctate, along midline densely punctate with small to minute punctures, mesially openly punctate with larger punctures, laterally in parapsidal areas and along posterior margin densely punctate. Scutellum 1.3 × longer than dorsal surface of propodeum, surface shining, openly punctate, except densely punctate along midline and along posterior margin. Dorsal surface of propodeum (fig. 62C) not defined by carinae, posterovertical carinae extend less than halfway to dorsal level, dorsal sculpture weak, ruguloso-striolate on basal half, weakly striolate laterally, sculpture not reaching rim, dorsal rim rounded and dull. T1 densely punctured except mesolaterally areas raised, shining and impunctate, posterior marginal area impunctate. Mesepisternum and upper half of metepisternum striate, remainder smooth. BP rounded.

Colour. Body black except mandibles red-brown apically, clypeus and antennae dark brown, mesoscutum tinged with blue, metasoma dark brown, posterior marginal areas light brown in some specimens.

Vestiture. Body sparse, head and mesoscutum with sparse cover of erect, branched and adpressed plumose hair, frons and clypeus with simple hair, tomentum present laterally on T2, across T3 and T4.

Description of male. Body length 5.85–6.62 mm ($\bar{x}$=6.21 mm, SD=0.27, n=7), head width 1.83–1.91 mm (n=7), forewing length 1.46–1.60 mm ($\bar{x}$=1.53 mm, SD=0.05, n=7). Relative dimensions: HW 100, HL 80–81, UID 62–63, LID 47–48, AOD 16–17, IAD 13–14, OAD 26–27, IOD 19–20, OOD 16–17, CL 18–19, GW 14–15, EW 30–31, ML 39–40, SL 27–28, FL 92–96.

Structure. Head broad, inner orbits converging below, eyes almost bare, a few minute, sparsely separated setae; clypeus weakly convex, closely punctate, with pale yellow marking on at least basal half, remainder brown, supraclypeal area flat, shining, sculpture similar to female. Antennae moderately short (FL 1.52 × UID), AS4: AS2+3=0.8. Remainder of body similar to female except but with mesoscutal punctation openly to sparsely punctate mesially, closely punctate in parapsidal areas; colour similar to female except metasoma and legs light brown in some specimens, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, frons and paraocular areas with short, adpressed plumose hair forming a mat, weak tomentum present laterally on T2 and T3. S2–S4 with moderate cover of long, plumose, posteriorly directed hair across sternites, S5 and S6 with short, simple, adpressed hair almost bare.

Genitalia and associated sterna (figs 62E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli with short simple setae, retrorse lobes setose, well developed, ventral flanges absent; S8 median process ventroapically with raised keel, glabrous, S7 median process rounded, glabrous.

Distribution (fig. 62D). Eastern zone of the Bassian province.

Floral Forage Record. Families visited=3. Catch total=6; Fabaceae (1 catch), Myrtaceae (4), Sapindaceae (1). Genera visited=4; *Acacia* (1), *Atalaya* (1), *Eucalyptus* (3), *Melaleuca* (1).

Flight Phenology.

2	0	0	0	0	0	0	0	2	0	3	2
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Cockerell's description lists four specimens in the type series. I have examined only one of these specimens, which had "type" written in Cockerell's handwriting. Ron McGinley (personal communication) has supplied the location of another syntype but the location of the remaining two specimens is unknown.

Lasioglossum (Chilalictus) cardaleae sp. nov.

Figures 23C–D, 63A–E

Material examined. Holotype ♂, New South Wales, Monga State Forest (35°38′S, 149°54′E), 18 Feb 1983, IDN & JCC, ex ethanol (ANIC).

Paratypes (4♂♂). New South Wales: 2♂♂, Barrington Tops (31°59′S, 151°27′E), 7 Apr 1949, E.F. Riek (ANIC); 1♂, same data as holotype (ANIC).

Victoria: 1♂, Karlo Ck, 21 km NE of Cann River (37°32′S, 149°24′E), 25 Feb 1980, IDN & JCC (ANIC).

Diagnosis. Most like *L. alpinum*, easily distinguished by shape of male mesoventral processes. Male with body black, antennae moderately long (FL 1.81 × UID), AS4:AS2+3=1, mesoventral area with two juxtaposed, elongate, apically bluntly rounded processes set at right angles to body, S2 with dense row of plumose, posteriorly directed hair, S3 with reduced amount of similar hair, forewings with 2nd r-m weaker than 1st r-m.

Description of male (female unknown). Body length 4.16–4.54 mm ($\bar{x}$=4.34 mm, SD=0.16, n=5), head width 1.32–1.44 mm (n=5), forewing length 1.15–1.22 mm ($\bar{x}$=1.19 mm, SD=0.03, n=5). Relative dimensions: HW 100, HL 86–87, UID 60–61, LID 44–45, AOD 13–14, IAD 14–15, OAD 28–29, IOD 18–19, OOD 19–20, CL 19–20, GW 17–18, EW 30–31, ML 38–39, SL 26–27, FL 110–112.

Structure. Head broad though distinctly triangular, inner orbits converging below, median frontal carina well developed, reaches median ocellus, eyes with a sparse cover of minute setae. Antennae moderately long (FL 1.81 × UID), AS4:AS2+3=1. Scape well short of reaching median ocellus. Clypeus weakly convex, surface shining, except dull along anterior margin, basally indistinctly roughened with shallow, irregular grooves and a few punctures, basal half pale yellow, anteriorly black, almost impunctate, with a few small, shallow punctures, supraclypeal area well projected mesially, sparsely punctate with minute punctures. Frons striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum anterior margin rounded, surface shining except anteriorly dull and impunctate, mesially densely punctate, parapsidal areas impunctate though roughened; mesoventral area with two juxtaposed, elongate, apically bluntly rounded

processes set at right angles to body, processes parallel (figs 23C, 23D), processes separated by distance less than one-third of IAD. Scutellum 1.1 × longer than dorsal surface of propodeum, surface shining, mesially openly punctate, closely to densely punctate along midline and around margins. Dorsal surface of propodeum not defined by carinae, posterovertical carinae not reaching halfway to dorsal level, dorsal sculpture smooth to micro-alveolate except weakly ruguloso-striolate on basal third, dorsal rim dull, gently curved to vertical surface. T1 densely punctate. Mesepisternum and metepisternum smooth. Forewings with 2nd r-m weaker than 1st r-m; BP rounded.

Colour. Body black except clypeus as noted, mandibles pale yellow except red-brown apically, antennal flagellum light brown underneath, metasoma suffused with brown, except tibiae apically and basally and tarsi light amber.

Vestiture. Frons with erect, simple and weakly branched hair, lower paraocular areas with some adpressed, plumose hair not forming a mat, mesoscutum with erect, minutely branched hair, mesoventral processes almost glabrous, mesepisternum with long, branched hair, weak metasomal tomentum laterally on T2 and T3; S2 with dense row of semi-adpressed, plumose, posteriorly directed hair, S3 with reduced amount of similar hair, S4 with small amount of branched hair mesially, remainder of S4, S5 and S6 with sparse, simple, adpressed hair.

Genitalia and associated sterna (figs 63B–E). Gonobase sides slightly flanged basally, gonocoxite without setae, gonostyli long, apically enlarged, dorsal surface with long simple hair and several elongate, thickened, weakly branched setae at apex, ventral surface with a few minute setae, retrorse lobes setose, moderately well developed, ventral flanges absent; S8 median process short, apically rounded with keel at apex, glabrous, S7 median process short, rounded, glabrous.

Distribution (fig. 63A). High altitude localities in southeastern New South Wales and in Victoria.

Etymology. The epithet *cardaleae* is in recognition of Ms J.C. "Jo" Cardale, who collected many specimens used in this study.

Floral Forage Record. None available.

Flight Phenology.

0	2	0	1	0	0	0	0	0	0	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. There is evidence of a weak clinal size variation, with southern males slightly larger than northern specimens.

Lasioglossum (Chilalictus) carpobrotum sp. nov.

Figures 64A–H

Material examined. Holotype. ♀, South Australia, 10 km N of Port Wakefield (34°06′S, 138°09′E), 23 Oct 1990, KLW, on *Carpobrotus* (NMV T-15541, labrum on separate pin, right hind leg glued to pith.)

Paratypes. 1♀ 1♂, same data as holotype (NMV ♀ T-15542, ♂ T-15543)

Diagnosis. Most like *L. cephalochilum.* Both sexes with head and mesosoma black, metasoma light red-brown in female, dark brown in male, female clypeus light brown basally. Female with frons striate, mesoscutum anterior margin with weak mesial projection, surface dull with concentric circle lineolation, two small areas shining mesially, mesially and parapsidal openly to sparsely punctate, mesoventral area with hair branched only on anterior surface of shaft, only dorsal surface of propodeum defined by weak, thin, posterior carinae set just below dorsal level. Male with antennae moderately short (FL 1.18 × UID), AS4:AS2+3=0.5, mesoscutum lineolation as in female, mesoventral area with two large process, processes posteriorly directed at acute angle, apically hooked, S2 and S3 with dense cover of erect, plumose hair across sternites, apically hair curved posteriorly, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 5.24-5.31 mm (n=2), head width 1.51-1.55 mm (n=2), forewing length 1.27-1.29 mm (n=2). Relative dimensions: HW 100, HL 90–91, UID 67–68, LID 59–60, AOD 19–20, IAD 13–14, OAD 29–30, IOD 20–21, OOD 18–19, CL 21–22, GW 17–18, EW 23–24, SL 38–40, FL 61–62.

Structure. Head elongate, distinctly triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with a sparse cover of minute setae. Scape reaches median ocellus. Clypeus short (CL 0.37 × LID), flat mesially, weakly convex laterally, surface smooth and polished, weakly openly to sparsely punctate with small, shallow punctures, weak reticulation along anterior margin, supraclypeal area almost flat, slightly raised mesially, shining mesially, dull around margins, sparsely punctate with minute punctures. Frons (fig. 64A) striate above antennal bases, striae meet basally along median frontal carina, sculpture laterally

weakens to smooth with a few punctures, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 64B) median basal area weakly raised, nodulated, nodules distinctly separated, anterior margin rounded mesially, distal process not widest at base, weakly flanged distally, median keel just extends to distal margin, lateral ridges absent, setae not present across distal margin, setae originate submarginally, lateral teeth absent. Pronotum dorsolateral angles bluntly obtuse, well projected. Mesoscutum (fig. 64C) anterior margin with rounded weak mesial projection, punctation fine, surface dull with fine lineolation in concentric circles on either side of midline, weakly striolate along midline area, two small mesial areas shining, anteriorly impunctate, along midline closely punctate, mesially and parapsidal areas openly to sparsely punctate. Scutellum 1.2 × longer than dorsal surface of propodeum, surface shining, sparsely punctate with minute punctures. Dorsal surface of propodeum (fig. 64C) defined by weak, thin, posterior carinae set just below dorsal level, posterovertical carinae not reaching halfway to dorsal level, dorsal sculpture almost smooth, surface dull, micro-alveolate with weak rugulose-striolate mesially on basal one quarter only, dorsal rim dull, gently curved onto vertical surface. T1 openly punctate except posterior marginal area impunctate. Mesepisternum and metepisternum smooth to finely striate. Fore inner tibial spur comb-shaped though short; BP rounded.

Colour. Head and mesosoma black, metasoma light red-brown, mandibles amber except apically dark red-brown, basal third of clypeus light brown to light red-brown, antennal flagellum light brown underneath, T1 anteromesially and mesially suffused with brown, lateral margin of T3 with small dark brown area, legs brown.

Vestiture. Body sparse, frons with some erect, minutely branched hair, lower paraocular areas with some semi-adpressed, branched hair, mesoscutum with sparse cover of erect, branched hair, mesoventral area with hair branched on anterior surface of hair shaft only, weak metasomal tomentum laterally on T2, almost across T3.

Description of male. Body length 4.62mm, head width 1.53mm, forewing length 1.28mm. Relative dimensions: HW 100, HL 91, UID 68, LID 52, AOD 18, IAD 15, OAD 27, IOD 23, OOD 20, CL 21, GW 17, EW 26, ML 38, SL 31, FL 80.

Structure. Head elongate, inner orbits converging below, eyes with sparse cover of minute setae, clypeus weakly convex, polished, indistinctly punctate with weak, small, shallow punctures, basal half pale yellow, supraclypeal area flat, shining. Antennae moderately short (FL 1.18 × UID), AS4:AS2+3=0.5. Remainder similar to female except scapes just reaching median ocellus, mesoscutum concentric lineolation distinctly producing striae along midline, shining areas on either side of midline larger than in female, punctation openly punctate mesially and along midline, closely to densely punctate in parapsidal areas, scutellum highly polished, sparsely punctate, mesoscutum not defined posteriorly by carinae, surface smooth except a few weak striae mesially, colour similar to female except metasoma dark brown on anterior half and brown on posterior half of each tergite, legs with light red-brown apically and basally on tibiae, knees and tarsi white, mesoventral area with two large process, process length equal to IAD, separated by distance greater than SL, posteriorly directed at acute angle, apically hooked (c.f fig. 24D), area between processes recessed; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, frons, paraocular areas and supraclypeal area with short, adpressed, plumose hair forming a mat, genae with dense hair cover, mesoscutum with sparse cover of short, branched hair, metasomal tomentum present laterally on T2 and T3; S2 and S3 with dense cover of erect, plumose hair across sternites, apically hair curved posteriorly, S2 hair longer than S3, S4 with adpressed hair, S5 and S6 with sparse cover of short, simple hair.

Genitalia and associated sterna (figs 64E–H). Gonobase sides narrowed basally, gonocoxite without setae, dorsal surface striate, gonostyli long, apically flanged, with erect, branched setae, inner surface of each with several thickened setae, retrorse lobes setose, weakly developed, ventral flanges absent; S8 median process moderately short, tapered, apically rounded, glabrous, S7 median process rounded, glabrous.

Distribution (fig. 64D). Port Wakefield area, South Australia.

Etymology. The epithet *carpobrotum* refers to the presumed food plant of the species.

Floral Forage Record. Family visited and Catch total=1; Aizoaceae (1 catch). Genus visited, *Carpobrotus* (1).

Flight Phenology.

0	0	0	0	0	0	0	0	0	1	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum carpobrotum is one of three species in which the male has apically hooked mesoventral processes and the only one in which the female has been associated. The labrum characters of the female and mesoventral hair characters of the male, suggest that these three species are closely allied to the species-groups of bees that feed mainly on *Wahlenbergia* and whose males also possess mesoventral processes.

Lasioglossum (Chilalictus) castor sp. nov.

Figures 65A–H

Material examined. Holotype. ♀, Western Australia, 39 km NNW of Gingin (31°01′S, 115°55′E), 14 Nov 1989, KLW, on *Melaleuca* (NMV T-15544).

Paratypes (17♀♀ 5♂♂). Western Australia: 5♀♀, 2♂♂, 60 km NE of Wubin, 27 Sep 1981, IDN & JCC (ANIC); 1♀ 1♂, 49 km NE of Wubin (29°47′S, 117°00′E), 27 Sep 1981, IDN & JCC (ANIC); 3♀♀, 1♂, same data as holotype (NMV; ♀♀ T-15545–15547, ♂ T-15548); 4♀♀, 1♂, Melaleuca Park, 12 km NE of Wanneroo (31°42′S, 115°51′E), 18 Nov 1982, TFH, 506-1, on flowers of *Lechenaultia stenosepala* (WAM); 4♀♀, 100 km N of Gingin (31°48′S, 115°52′E), 14 Nov 1989, KLW, on *Conospermum* (NMV T-15549–15552).

Other specimens examined (146♀♀, 18♂♂). Western Australia: Albany, Stirling Ranges, Hamersley R. X-ing, Yallingup, Dumbleyung, Lake King, Hatters Hill, Tarin Rock, Waroona, Peak Charles, Hatter Hill, Pingelly, Norseman, Perth, Beverley, Palmyra, Rottnest Is., Glen Forrest, Helena Valley, Chidlow, Bullsbrook, Northam, Merredin, Kellerberrin, Yellowdine, Bolgart, Darling Ranges, Coolgardie, Bullabulling, Cataby, Badgingarra, Goongarrie, Eneabba, Menzies, Mt Singleton, Paynes Find, Dongara, Geraldton, Youanmi, Horrocks, Northampton, Anketell HS, Sandstone, Kalbarri, Wannoo, Carnarvon.

Diagnosis. Most like *L. pollux*. Both sexes black. Female with frons reticulate/striate, mesoscutum shining, densely punctate, dorsal surface of propodeum coarsely ruguloso-striolate, not defined by carinae, T1 with median lateral tomentose hair tufts, BP narrowed, acutely pointed. Male with antennae moderately long, AS4: AS2+3=1.2, S2–S4 with sparsely hirsute, S5–S6 almost glabrous, pygidial plate rounded, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.39–7.24 mm ($\bar{x}$=6.77 mm, SD=0.28, n=10), head width 1.86–2.16 mm (n=10), forewing length 1.62–1.88 mm ($\bar{x}$=1.78 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 82–84, UID 59–60, LID 56–57, AOD 20–21, IAD 9–10, OAD 27–29, IOD 19–20, OOD 16–17, CL 20–21, GW 17–19, EW 23–24, SL 39–41, FL 63–65.

Structure. Head broad, distinctly triangular, inner orbits converging below, median frontal carina extends about halfway to median ocellus, eyes sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.36 × LID), almost flat, lateral margins convex, surface shining, similar sized punctures occur over surface, basally openly to closely punctate, anteriorly densely punctate, supraclypeal area weakly projected, shining, densely punctate except along midline openly punctate. Frons (fig. 65A) reticulate though reticulation partially forming weak striations above antennal bases, sculpture laterally weakens to almost smooth along orbits, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 65B) median basal area gently raised, surface distinctly setose, setae not arising from raised nodules, anterior margin rounded mesially, distal process not widest at base, weakly flanged distally, median keel spatulate, projected beyond distal margin, lateral keels absent, distal margin setose, lateral teeth small, distally straight. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 65C) anterior margin rounded, punctation conspicuously coarse, surface shining except anteromesially dull and impunctate, remainder densely punctate, punctures almost contiguous over entire surface. Scutellum 1.2 × longer than dorsal surface of propodeum, surface shining, densely punctate except mesially closely punctate. Dorsal surface of propodeum (fig. 65C) not defined by carinae, posterovertical carinae extend less than halfway to dorsal level, dorsal sculpture ruguloso-striolate, extends to dorsal rim mesially, beyond rim laterally. T1 densely punctate. Mesepisternum and metepisternum weakly striate. BP narrowed, acutely pointed.

Colour. Body black except mandibles apically red-brown, flagellum brown underneath, metasomal posterior marginal areas on T2–T4 light brown, legs tinged with brown.

Vestiture. Body sparse, frons and paraocular areas with semi-erect, long, branched hair, paraocular hair denser, clypeus and supraclypeal area almost glabrous, with a few minutely branched hairs, mesoscutum with a sparse cover of short, erect, branched hair, metanotum with a dense mat of short hair, T1 with anterolateral tufts of short, adpressed, posterolaterally directed plumose hair forming a tomentum,

other tomentum present laterally on T2, across T3 and T4.

Description of male. Body length 5.00–5.62 mm ($\bar{x}$=5.23 mm, SD=0.19, n=10), head width 1.55–1.74 mm (n=10), forewing length 1.43–1.55 mm ($\bar{x}$=1.51 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 88–89, UID 61–62, LID 50–51, AOD 16–17, IAD 15–16, OAD 26–27, IOD 21–22, OOD 16–17, CL 21–22, GW 16–18, EW 27–28, ML 37–39, SL 25–26, FL 153–155.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of minute setae, scape reaches just over halfway to median ocellus, clypeus flat, shining, weakly sculptured, basal half with white/pale yellow marking, supraclypeal area weakly projected, shining, median frontal carina extends less than halfway to median ocellus. Antennae moderately long (FL 2.5 × UID), AS4:AS2+3=1.2. Remainder similar to female, mesoscutum shining, densely punctate, interspaces distinctly present, dorsal surface of propodeum coarsely rugulosostriolate, extends beyond rim laterally, to rim mesially, rim with dull sheen, pygidial plate rounded, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, frons with adpressed simple and erect branched hair, paraocular areas with adpressed, plumose hair almost forming a mat, clypeus and supraclypeal area almost glabrous, metanotum without hair mat, T1 with minutely branched hair laterally, not forming tomentum, T2 with lateral tomentum, across T3; S2–S4 with sparse, erect, minutely branched hairs, not forming rows across sternites, S5 with a few short, setae, S6 glabrous and shining.

Genitalia and associated sterna (figs 65E–H). Gonobase sides weakly flanged basally, gonocoxite without setae, gonostyli long, weakly swollen apically, with sparse cover of short setae, retrorse lobes setose, well developed and elongate, ventral flanges absent; S8 median process short, apically rounded, with a few setae, S7 median process rounded apically, glabrous.

Distribution (fig. 65D). Southwest of Western Australia, except in the high rainfall area of the southwest corner.

Etymology. Due to the similarity of *L. castor* and *L. pollux*, they may be considered twins. The epithet of each species is from the astrological names for the two stars in the constellation of Gemini and are to be considered as nouns in apposition.

Floral Forage Record. Families visited=11. Catch total=35; Compositae (2 catches), Dicrastylidaceae (1), Fabaceae (2), Goodeniaceae (3), Haemodoraceae (1), Myrtaceae (14), Orchidaceae (2), Proteaceae (7), Rutaceae (1), Thymelaeacae (1), Xanthorrhoeaceae (1). Genera visited=24; *Baeckea* (2), *Boronia* (1), *Caladenia* (1), *Calotis* R.Br. (1), *Conospermum* Sm. (1), *Conostylis* R.Br. (1), *Dasypogon* R.Br. (1), *Daviesia* (1), *Eucalyptus* (3), *Goodenia* Sm. (1), *Grevillea* (3), *Hakea* (2), *Lambertia* Sm. (1), *Lechenaultia* R.Br. (1), *Leptospermum* (1), *Melaleuca* (5), *Micromyrtus* Benth. (1), *Pimelea* (1), *Pityrodia* R.Br. (1), *Prasophyllum* R.Br. (1), *Scaevola* (1), *Senecio* (1), *Swainsona* Salisb. (1), *Verticordia* DC. (2).

Flight Phenology.

1	0	0	1	0	2	0	8	18	17	19	7
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The females of *L. castor*, *L. pollux* and *L. pulvitectum* are indistinguishable, although, the three species can be separated on their known distributions: *L. pollux* and *L. castor* in northern and southern Western Australia respectively and *L. pulvitectum* in the eastern states. In many female specimens, the hair tufts have a "wet" appearance, adhering to the tergite and are therefore difficult to see. The males of the three species provide useful characters to aid separation.

Lasioglossum (Chilalictus) cephalochilum Michener

Figures 23E, 25A, 66A–H

Lasioglossum (Chilalictus) cephalochilum Michener, 1965: 314.

Material examined. Holotype. ♀, Queensland, Glen Innes (29°44′S, 151°44′E), 6 Nov 1958, C.D. Michener, on *Leptorhynchos squamatus* (ANIC).

Other specimens examined (23♀♀, 4♂♂). Queensland: Emu Vale, Stanthorpe, Helidon, Oakey, Condamine, Bunya Mtn Nat. Pk.

New South Wales: Coonabarabran, Narrabri, Guyra, Glen Innes.

Diagnosis. See *L. carpobrotum*. Both sexes black. Female with frons striate, mesoscutum surface shining, densely punctate except small median areas openly to closely punctate, dorsal surface of propodeum striolate, defined by weak posterior carinae set just below dorsal level. Male with Antennae moderately short (FL 1.49 × UID), AS4:AS2+3=0.54, mesoventral area with two apically pointed processes, S2–S4 with

long, curved plumose hair, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.62–5.54 mm ($\bar{x}$=5.12 mm, SD=0.24, n=10), head width 1.50–1.72 mm (n=10), forewing length 1.25–1.48 mm ($\bar{x}$=1.32 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 82–84, UID 65–67, LID 54–56, AOD 20–21, IAD 11–12, OAD 31–32, IOD 19–20, OOD 19–20, CL 18–19, GW 16–17, EW 25–27, SL 35–37, FL 60–62.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes appear bare. Scape just reaches anterior margin of median ocellus. Clypeus short (CL 0.34 × LID), convex ventrally, shining except dull along anterior margin, mesially with small, shallow punctures closely punctate, laterally almost smooth, few broad, shallow punctures, anteriorly densely punctate with small, rounded punctures, supraclypeal area almost confluent with contours of clypeus, shining, closely to densely punctate with small punctures. Frons (fig. 66A) striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 66B) median basal area raised, densely nodulated, anterior margin rounded mesially, distal process not widest at base flanged distally, median keel broadly spatulate at distal end, lateral ridges weakly present, not extending near margin, distal margin setose, setae originate submarginally, lateral teeth absent. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 66C) anterior margin rounded, punctation moderately coarse, anteriorly impunctate and dull, remainder of surface shining, densely punctate along midline, laterad of parapsidal lines and in parapsidal areas, openly to closely punctate in two small areas on either side of midline just short of parapsidal lines. Scutellum 1.3 × longer than dorsal surface of propodeum, surface shining, sparsely to openly punctate except densely punctate around margins. Dorsal surface of propodeum (fig. 66C) defined by weak posterior carinae set just below dorsal level, posterovertical carinae extend about halfway to dorsal level, dorsal sculpture weak, striolate except mesially where a few interconnectives give ruguloso-striolate appearance, sculpture not reaching dorsal rim, rim with a dull sheen. T1 densely punctate. Mesepisternum and metepisternum finely striate on upper half, remainder smooth. BP rounded.

Colour. Body black except mandibles light red-brown, dark red-brown apically, antennal flagellum light brown underneath, metasomal tergites with posterior marginal areas brown, legs brown with tarsi light brown.

Vestiture. Body sparse, lower paraocular areas with some adpressed, plumose hair, frons with short, simple and erect, minutely branched hair, mesoscutum and mesoventral area with erect, minutely branched hair (fig. 25A), metasomal tomentum laterally present on T2, across T3 and T4.

Description of male. Body length 3.93–4.08 mm ($\bar{x}$=4.03 mm, SD=0.09, n=3), head width 1.46–1.51 mm (n=3), forewing length 1.15–1.20 mm ($\bar{x}$=1.18 mm, SD=0.03, n=3). Relative dimensions: HW 100, HL 83–84, UID 66–67, LID 48–50, AOD 17–18, IAD 13–14, OAD 28–29, IOD 19–20, OOD 21–22, CL 19–20, GW 15–16, EW 29–30, ML 39–40, SL 30–31, FL 98–100.

Structure. Head broad, inner orbits converging below, eyes appear bulbous in frontal and sides views, eyes bare, clypeus convex, shining and impunctate except a few punctures anteriorly, basal half with pale yellow marking, supraclypeal area flat, shining, impunctate. Antennae moderately short (FL 1.49 × UID), AS4: AS2+3=0.54. Remainder of body similar to female except dorsolateral angles of pronotum broadly rounded, mesoscutum shining, openly to closely punctate across surface, dorsal surface of propodeum posterior carina just present, dorsal sculpture ruguloso-striolate mesially, dorsal rim smooth and shining, T1 sparsely to openly punctate, mesoventral area with two apically pointed, well separated processes (fig. 23E) set at right angles to body; colour similar to female except metasoma brown; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, paraocular areas and anterior margin of clypeus with short, adpressed, plumose hair forming a weak mat, mesoscutum with sparse, erect, minutely branched hair, metasomal tomentum almost absent, weakly present laterally on T2; S2–S4 with long, curved plumose hair, hair not reaching margins of sternites, S5 and S6 with adpressed simple hair.

Genitalia and associated sterna (figs 66E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli long, apically swollen, with short, weakly branched and simple setae except with several thickened sword-shaped setae with serrate lower margins, retrorse lobes finely

setose, well developed, ventral flanges present, penis valves dorsally flanged along outer margin; S8 median process elongate, tapered to rounded apex, setose along apical margins with simple setae, S7 median process rounded, glabrous.

Distribution (fig. 66D). Southeastern Queensland and northeastern New Wales on the tablelands west of the Great Dividing Range.

Floral Forage Record. Families visited=3. Catch total=3; Compositae (1 catch), Myrtaceae (1), Sapindaceae (1). Genera visited=3; *Atalaya* (1), *Leptorhynchus* Less. (1), *Leptospermum* (1).

Flight Phenology.

2	0	0	0	0	0	0	0	0	4	3	2
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum cephalochilum belongs to the species-group in which males possess mesoventral processes. Members of this group appear to mainly feed on *Wahlenbergia*. Michener (1965, p. 314) did not consider *L. cephalochilum* to be a "*Wahlenbergia* bee" and to date the species has no floral forage records on Campanulaceae. Two female specimens from Birdwood, South Australia (NMV) and 53 km E of Hyden, Western Australia (WAM 87/104) have similar frons, mesoscutum and propodeum characters but do not possess the characteristic shape of the median keel on the labrum. As these specimens could not be associated with any other species, I have tentatively identified them as *L. cephalochilum*. The South Australian specimen was collected on same plant species (*Leptorhynchos squamatus*) as the holotype. The unusual labrum median keel shape also occurs on *L. alacarinatum*.

Lasioglossum (Chilalictus) chapmani (Cockerell)

Figures 15E, 27E, 67A–H

Halictus chapmani Cockerell, 1910b: 273.

Lasioglossum (*Chilalictus*) *chapmani*. — Michener, 1965: 175.

Material examined. Holotype, ♀, Western Australia, N.H. oce. Preiss. 2564 (Berlin).

Other specimens examined (276♀♀, 93♂♂). Queensland: Stanthorpe, Yelarbon, St. George, Sunnybank, Tamborine, Brisbane, Fernvale, Condamine, Mungalla, Cooloola, Eidsvold, Moura, Boulia, Mt Garnet.

New South Wales and Australian Capital Territory: Wyong, Yarramalong, Kinchega, Denman, Mt Grenfell, Cobar, Coonabarabran.

Victoria: Grampians, Kiata.

South Australia: Millicent, Rendelsham, Robe, Naracoorte, Padthaway, Bordertown, Coorong Nat. Park, Meningie, Lameroo, Tailem Bend, Hartley, Murray Bridge. Mannum, Sandy Creek, She Oak Log, Arthurton, Waikerie, Balaklava, Morgan, Melrose, Orroroo, Poochera, Beda Hill, Wynbring rocks, Emu, Everard Park Station.

Northern Territory: Alice Springs, Erldunda, Corroboree Rock, Aileron, Barrow Creek, Ti-Tree.

Western Australia: Katanning, Kojonup, Boyup Brook, Yallingup, Cape Lewin, Bunbury, Salmon Gums, Bannister, Norseman, Lake Cronin, Bushmead, Midland, Toodyay, Northam, Bullsbrook, Carrabin, Bolgart, Southern Cross, Weowanie Rock, Bungalbin Hill, Neale Junction, Yeo Lake, Banjiwarn HS, Irrunytju Rockhole, Hinckley Range, Giles.

Diagnosis. Most like *L. expansifrons*. Both sexes with body black. Female with head triangular in shape, frons coarsely reticulate/striate, pronotal dorsolateral angles acute, mesoscutum densely punctate, surface shining, dorsal surface of propodeum weakly defined posterolaterally by carinae, dorsal sculpture ruguloso-striolate. Male with antennae moderately long, face covered with dense hair, S2–S4 with long plumose posteriorly directed hair in rows across sterna; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.39–7.70 mm ($\bar{x}$=7.05 mm, SD=0.43, n=10), head width 1.93–2.33 mm (n=10), forewing length 1.69–1.95 mm ($\bar{x}$=1.79 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 81–84, UID 60–61, LID 52–55, AOD 20–21, IAD 11–12, OAD 25–27, IOD 19–20, OOD 14–15, CL 21–23, GW 14–15, EW 25–26, SL 37–40, FL 74–76.

Structure. Head broad, triangular in shape, inner orbits converging below, median frontal carinae reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.42 × LID), convex, surface shining, openly to closely punctate, supraclypeal area weakly projected, shining, openly punctate. Frons (fig. 67A) coarsely reticulate/striate above antennal bases, sculpture laterally weaker, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 67B) basal median area raised, surface smooth, anterior margin rounded, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges weak, not reaching distal margin, setae not present across distal margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles acute, weakly projected. Mesoscutum (fig. 67C) anterior margin

rounded, surface shining anterior margin dull with fine lineolation, punctation moderately coarse, surface densely punctate. Scutellum 1.2 × longer than dorsal surface of propodeum, surface shining, openly to closely punctate. Dorsal surface of propodeum (fig. 67C) weakly defined posterolaterally by carinae set well below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal sculpture ruguloso-striolate, extends to rim. T1 densely punctate (fig. 15E). Mesepisternum and metepisternum striate. BP rounded.

Colour. Body black with antennae, legs and anterior margin of tergites brown.

Vestiture. Body sparse, paraocular area with adpressed and erect branched hair, clypeus almost glabrous, frons with erect, simple hair, mesoscutum with short, erect, branched hair, tomentum laterally on T2, across terga on T3 and T4.

Description of male. Body length 4.85–5.62 mm ($\bar{x}$=5.39 mm, SD=0.26, n=10), head width 1.51–1.81 mm (n=10), forewing length 1.29–1.64 mm ($\bar{x}$=1.44 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 85–88, UID 61–62, LID 45–47, AOD 15–17, IAD 15–16, OAD 27–28, IOD 22–23, OOD 15–16, CL 18–20, GW 17–18, EW 28–30, ML 37–38, SL 26–27, FL 143–145.

Structure. Head triangular shape, inner orbits converging below, eyes with sparse minute setae, scape not reaching median ocellus; clypeus and supraclypeal area shining, indistinctly punctate, clypeus yellow on basal half to three-quarters. Antennae moderately long (FL 2.31 × UID), AS4:AS2+3=1. Remainder of body similar to female except mesoscutum punctation close mesially, posterolateral propodeum carinae absent, dorsal rim smooth and rounded, metasoma brown, tarsi and tibiae apically and basally light yellow-brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Frons, paraocular areas and supraclypeal area with dense, short, adpressed hair forming a mat, anterior margin of clypeus with similar hair, T2 and T3 with weak lateral tomentum; S2–S4 with long, plumose, posteriorly directed hair in rows across sterna, S5 with sparse, short simple setae (fig. 27E).

Genitalia and associated sterna (figs 67E–H). Gonobase slightly narrowed basally, gonocoxite with setae on apical inner margin and lateral setae, gonostyli with simple and branched setae, penis valves broadened on vertical surface, retrorse lobes setose, well developed, ventral flanges absent; S8 median process large, apically rounded, glabrous, S7 median process rounded, a few simple setae.

Distribution (fig. 67D). Mainly in the Eyrean province, but also occurs in the high rainfall areas of southwest Western Australia.

Floral Forage Record. Families visited=23. Catch total=81; Aizoaceae (1 catch), Campanulaceae (2), Compositae (5), Cruciferae (1), Dicrastylidaceae (2), Ehretiaceae (1), Epacridaceae (1), Fabaceae (10), Frankeniaceae (1), Hydrocotylaceae (1), Loranthaceae (2), Malvaceae (2), Myoporaceae (3), Myrtaceae (36), Pittosporaceae (4), Portulacaceae (1), Proteaceae (2), Rhamnaceae (1), Rosaceae (1), Santalaceae (1), Sapindaceae (1), Sterculiaceae (1), Tamaricaceae (1). Genera visited=36; unidentified genus of Compositae (1), *Acacia* (2), *Alphitonia* Reissek ex Endl. (1), *Amyema* (1), *Angophora* (1), *Astartea* DC. (1), *Atalaya* (1), *Brassica* L. (1), *Bursaria* (4), *Calandrinia* (1), *Cassia* (4), *Dicrastylis* Drumm. ex Harv. (2), *Eremophila* (3), *Erigeron* L. (1), *Eucalyptus* (23), *Exocarpus* Labill. (1), *Frankenia* (1), *Grevillea* (2), *Halgania* (1), *Helichrysum* (2), *Hibiscus* (2), *Jacksonia* (2), *Keraudrenia* J. Gray (1), *Leptospermum* (3), *Leucopogon* (1), *Malus* Mill. (1), *Melaleuca* (7), *Mesembryanthemum* (1), *Nuytsia* R.Br. (1), *Parkinsonia* (1), *Pultenaea* (1), *Senecio* (1), *Tamarix* L. (1), *Thryptomene* (1), *Trachymene* Rudge (1), *Wahlenbergia* (2).

Flight Phenology.

12	16	9	1	3	0	0	3	13	24	24	12
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Female specimens of *L. chapmani* and *L. expansifrons* are similar, although separated by characters noted in the key (couplet 188). In addition, the male ventral metasomal pubescence and genitalia are strikingly different.

Lasioglossum (Chilalictus) clariventre (Friese)

Figures 8E, 68A–H

Halictus clariventris Friese, 1924: 242.

Lasioglossum (Chilalictus) clariventre. — Michener, 1965: 175.

Material examined. Holotype. ♀, South Australia, Adelaide (34°56′S, 138°36′E), 21 Sep 1909, Frank (Orange "TYPUS" label). Am. Mus. Nat. Hist. Dept. Invert. Zool. No. 26910 (AMNH, head glued to body.)

Other specimens examined (36♀♀, 1♂). South Aus-

tralia: Adelaide, Cummins, Orroroo, Lake Frome, Coward Springs.

Western Australia: Mt Barker, Esperance, Donnybrook, Salmon Gums, Narrogin, Mogumber, Miling, Dongara.

Diagnosis. Most like *L. globosum*, separated on mesoscutum sculpture. Both sexes with body black. Female with frons striate, mesoscutum dull, with complete lineolation cover, weak punctation, dorsal surface of propodeum rugulosostriolate, defined posterolaterally by weak carinae, T1 almost impunctate, S2 and S3 with hair branched on anterior side of shaft only. Male with antennae short, clypeus black, mesoscutum appears impunctate, metasomal T1 impunctate, S3–S5 with long branched hair with mesial gap; forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 6.16–7.70 mm ($\bar{x}$=7.01 mm, SD=0.41, n=10), head width 1.86–2.09 mm (n=10), forewing length 1.60–1.86 mm ($\bar{x}$=1.69 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 76–78, UID 67–68, LID 57–58, AOD 21–22, IAD 12, OAD 25–27, IOD 20–21, OOD 20–21, CL 19–20, GW 16–17, EW 23–24, SL 37–38, FL 58–60.

Structure. Head broad, inner orbits converging below, median frontal carina well developed, extends to median ocellus, carina with pore at midpoint (fig. 8E), eyes with sparse cover of minute setae. Scape reaching anterior margin of lateral ocelli. Clypeus short (CL 0.34 × LID), weakly convex, shining on basal half, remainder dull with minute, transverse lineolations, ventral margin densely punctate with large elliptical punctures, remainder of shining area closely punctate with large, close, circular punctures, dull area impunctate, supraclypeal area weakly bulbous, dull with minute lineolation, openly to closely punctate. Frons (fig. 68A) striate above antennal bases, sculpture laterally striate except broad margin along inner orbits smooth, extends around eyes onto vertex and genae. Genae along of outer margin of eyes smooth, remainder finely striate. Labrum (fig. 68B) basal median area slightly raised with several distinct nodules, anterior margin almost straight, distal process not tapered, flanged distally, median keel spatulate, extends slightly beyond distal margin, lateral ridges weak, set at oblique angle to median keel, well short of distal margin, distal margin setose, lateral teeth present, small, not hooked. Pronotum dorsolateral angles bluntly obtuse, weakly projected. Mesoscutum (fig. 68C) anterior margin rounded, punctation fine, surface dull, covered with weak lineolations, anteriorly and in parapsidal areas impunctate, remainder indistinctly punctured openly to sparsely punctate with small, shallow punctures. Scutellum 1.4 × longer than dorsal surface of propodeum length, surface dull, covered with fine lineolation, sparsely punctured. Dorsal surface of propodeum (fig. 68C) weakly defined by posterolateral carinae set just below dorsal level, posterovertical carinae extend at least halfway to dorsal carinae, dorsal sculpture rugulosostriolate mesially, striolate laterally, sculpture not reaching dorsal rim. T1 appears impunctate though is sparsely punctate with minute punctures. Mesepisternum and metepisternum with reticulate-lineolation pattern, almost smooth except few weak striae on upper half. BP rounded.

Colour. Head and mesosoma black except clypeus and lower paraocular areas tinged with brown, mandibles red-brown apically, flagellum segments, legs (including coxae) and metasoma light brown.

Vestiture. Body sparse, head and mesoscutum sparsely covered with erect, minutely branched hair, mesoventral hair minutely branched; S2 and S3 with long, erect, branched hair, branches only occur on anterior side of hair shaft; metasomal tomentum weakly present laterally on T2 and T3.

Description of male. Body length 6.08mm, head width 1.86mm, forewing length 1.65mm. Relative dimensions: HW 100, HL 80, UID 67, LID 49, AOD 19, IAD 14, OAD 24, IOD 23, OOD 20, CL 20, GW 21, EW 24, ML 36, SL 28, FL 94.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of minute setae, clypeus black, without any pale marking, frons above antennal bases weakly striate, laterally smooth, sculpture continues around behind eyes. Antennae moderately short (FL 1.40 × UID), AS4:AS2+3=0.75. Remainder of body similar to female but mesoscutum with midline raised on anterior half, punctation indistinct, appears impunctate, dorsal surface of propodeum not defined by carinae, T1 impunctate, forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Clypeus, supraclypeal area and lower paraocular areas densely covered with short, adpressed, branched hair forming a mat, similar hair on frons but erect and not forming a mat, S2 with some long, branched hairs; S3–S5

with long, branched hair across sternite with distinct mesial gap.

Genitalia and associated sterna (figs 68E–H). Gonobase sides slightly narrowed basally, gonocoxite without setae, dorsal surface striate, gonostyli with sparse, minute, simple setae, several thickened, elongate, branched setae apically, retrorse lobes finely setose, not well developed, ventral flanges absent, penis valves angular apically; S8 median process elongate, truncate, with large thickened setae; S7 median process rounded, glabrous.

Distribution (fig. 68D). Eastern South Australia across to southwestern Western Australia.

Floral Forage Record. Families visited=3. Catch total=6; Compositae (4 catches), Myrtaceae (1), Zygophyllaceae (1). Genera visited=6; *Arctotheca* Wendl. (1), *Eucalyptus* (1), *Helichrysum* (1), *Helipterum* (1), *Nitraria* (1), *Senecio* (1).

Flight Phenology.

0	0	0	0	1	0	1	1	4	7	2	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. No intraspecific variation was observed. The sex ratio (36♀♀: 1♂) demonstrates the lack of male specimens available for study.

Lasioglossum (Chilalictus) clelandi (Cockerell)

Figures 69A–H

Halictus clelandi Cockerell, 1910b: 272–273.

Halictus idoneus Cockerell, 1914a: 517, syn. nov.

Halictus granulithorax Cockerell, 1914a: 519, syn. nov.

Lasioglossum (*Chilalictus*) *clelandi*. — Michener, 1965: 175.

Lasioglossum (*Chilalictus*) *idoneum*. — Michener, 1965: 176.

Lasioglossum (*Chilalictus*) *granulithorax*. — Michener, 1965: 176.

Material examined. Holotype of *clelandi*, ♂, South Australia, Adelaide (34°56′S, 138°36′E), Schomburgk, 22117 (Berlin).

Holotype of *idoneus*, ♂, Queensland, Brisbane (27°28′S, 153°02′E), 3 Oct 1912, H. Hacker, QM Type 4119 (QM).

Syntypes of *granulithorax* (2♀♀), ♀, Victoria, 7 Feb 1901, C.F. Turner, T.D.A. Cockerell 1914-352, BM Type Hym 17.a.919 (BMNH); ♀, same data as other syntype (USNM).

Other specimens examined (222♀♀, 140♂♂). Queensland: Brisbane.

New South Wales & Australian Capital Territory: Goulburn, Yass, Bendora, Canberra, Braidwood, Carabost, Currowan St. Forest.

Victoria: Koetong, Wangaratta, Biggara, Mt Buffalo, Bendigo, Mt Arapiles, Mt McKay, Lah-Arum, Alexandra, Macedon, Creswick, Masons Falls, Marysville, Healesville, Dunkeld, Melbourne, Seville, Croydon, Boronia, Monbulk, Ferntree Gully, Emerald, Mordialloc, Cobboboonee State Forest, Nelson, Frankston, Yallourn, Gorae West, Pt Lonsdale, Anglesea, Portland, Otway Ranges, Beech Forest, Weeaproinah.

Tasmania: King Is, Marrawah, Winnaleah, Rowella, Frankford, Launceston, Wilmot, St Marys, Fingal Valley, Longford, Cradle Mountain, St Helens, Cressy, Poatina, Miena, Bronte Park, Bothwell, Ouse, Ellendale, Norfolk, Cambridge, Hobart, Cremorne, Grove.

South Australia: Warren Nat. Park, South Para Reserve, Port Lincoln, Birdwood, Vivonne Bay, Adelaide, Mt Lofty, Kangaroo Is., Penola, Nangwarry, Millicent, Mt Gambier, Port MacDonnell.

Diagnosis. Most like *L. asperithorax*. Both sexes with body black. Female with frons coarsely reticulate, labrum median keel spatulate, lateral ridges absent, mesoscutum anteriorly produced, not bilobed, conspicuously coarse with raised, contiguous reticulate pattern, dorsal surface of propodeum ruguloso-striolate, defined posterolaterally by carinae. Male with Lower paraocular areas with adpressed, branched hair, mesoscutal sculpture as in female, sparse setose across S2–S5; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.24–8.70 mm ($\bar{x}$=8.13 mm, SD=0.36, n=20), head width 2.16–2.68 mm (n=20), forewing length 2.00–2.33 mm ($\bar{x}$=2.17 mm, SD=0.10, n=20). Relative dimensions: HW 100; HL 77–79; UID 60–62; LID 55–57; AOD 20–21, IAD 10–11, OAD 24–26, IOD 17–18, OOD 16–17, CL 18–20, GW 16–18, EW 21–22, SL 38–40, FL 62–65.

Structure. Head distinctly wider than long, inner orbits converging below, median frontal carina not reaching median ocellus, eyes with minute sparse setae. Scape reaches anterior margin of lateral ocelli. Clypeus relatively short (CL 0.35 × LID), flat, slightly concave mesially, dull lustre on basal half, remainder with fine reticulation, closely to densely punctured, punctures mesially elongate, forming longitudinal grooves, supraclypeal area slightly bulbous, dull, covered with fine reticulation, closely to densely punctured, punctures small, shallow, circular. Frons (fig. 69A) coarsely reticulate above antennal bases and laterally to inner margins of orbits, sculpture extends to anterior margin of lateral ocelli. Labrum (fig. 69B) basal median area median area raised to distal margin, surface

roughened, distal process flanged distally, median keel spatulate, extending beyond distal margin, lateral ridges absent, lateral teeth present, small and hooked. Pronotum lateral processes bluntly obtuse, weakly projected. Mesoscutum (fig. 69C) anterior margin with rounded mesial projection, surface conspicuously coarse, dull, covered with dense, raised, contiguous reticulate pattern, diameter of mesial punctures distinctly narrower than diameter of lateral punctures. Scutellum 1.3 × longer than dorsal surface of propodeum, surface dull, densely punctured. Dorsal surface of propodeum (fig. 69C) defined posterolaterally by carinae, posterovertical carinae reach dorsal carinae, sculpture weak, ruguloso-striolate mesially, striolate laterally, smooth in posterolateral corners, sculpture reaching rim. T1 densely punctate. Mesepisternum and upper half of metepisternum weakly striate, remainder relatively smooth; BP bluntly obtuse.

Colour. Body black except mandibles red-brown apically, anterior margins of metasomal segments with brown tinge, antennal flagellum and legs dark brown; forewings with brown tinge.

Vestiture. Body sparse; head and mesoscutum sparsely covered with erect, minutely branched hair; tomentum on T2–T4.

Description of male. Body length 5.70–7.85 mm ($\bar{x}$=6.92 mm, SD=0.69, n=20), head width 1.67–2.12 mm (n=20), forewing length 1.41–2.00 mm ($\bar{x}$=1.72 mm, SD=0.17, n=20). Relative dimensions: HW 100, HL 85–87, UID 60–64, LID 46–49, AOD 17–18, IAD 13–14, OAD 24–25, IOD 17–18, OOD 15–17, CL 22–23, GW 18–20, EW 26–30, ML 38–40, SL 24–26, FL 140–145.

Structure. Head broad; inner orbits converging below, eyes with sparse cover of minute setae; clypeus with pale yellow marking on at least basal half; sculpture similar, but clypeus not concave mesially, punctures not forming grooves, clypeus shining, closely to densely punctured. Antennae moderately long (FL 2.26 × UID), AS4:AS2+3=1. Remainder of body similar but pronotal lateral process barely projected; dorsal surface of propodeum not defined by carinae; forewing with 2nd r-m as strong as 1st r-m.

Vestiture. Similar to female but lower paraocular areas with adpressed branched hair; sterna almost bare, few hairs across S2 and S3, S4 and S5 with minute hair.

Genitalia and associated sterna (figs 69E–H). Gonobase sides parallel, gonocoxite with large, stout setae on apical inner margin, gonostyli setae short, simple and branched, retrorse lobes well developed, finely setose apically remainder glabrous, ventral flanges present; S8 median process elongate, truncate, with simple setae, S7 median process rounded apically, glabrous.

Distribution (fig. 69D). Eastern zone of the Bassian province. The single southeast Queensland record is of doubtful validity. (See *Remarks.*)

Floral Forage Record. Families visited=11. Catch total=45; Anacardiaceae (1 catch), Campanulaceae (1), Compositae (4), Cruciferae (1), Dilleniaceae (1), Fabaceae (19), Iridaceae (2), Myrtaceae (12), Orchidaceae (1), Pittosporaceae (2), Xanthorrhoeaceae (1). Genera visited=26; *Acacia* (1), *Angophora* (1), *Bossiaea* (1), *Brassica* (1), *Bursaria* (2), *Calytrix* (2), *Daviesia* (3), *Dillwynia* (1), *Eucalyptus* (7), *Helipterum* (1), *Hibbertia* Andr. (1), *Hypochoeris* (1), *Jacksonia* (1), *Leptospermum* (1), *Medicago* (3), *Platylobium* Sm. (1), *Pultenaea* (1), *Schinus* (1), *Senecio* (1), *Taraxacum* (1), *Thelymitra* J.R. & G. Forst. (1), *Trifolium* L. (7), *Tristaniopsis* (1), *Wahlenbergia* (1), *Watsonia* (2), *Xanthorrhoea* (1).

Flight Phenology.

31	20	2	0	1	0	0	0	4	29	16	16
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The holotype of *Halictus idoneus* is housed in the QM. Based on the information contained in the original description, I consider the series of specimens in the USNM, indicated by Michener 1965 (p.176) as the type series, not to belong to the valid type series.

The *idoneus* type locality listed as Brisbane, yet this is the only Queensland record and is well outside the remaining known distributional range. Therefore, I suspect these specimens have been mislabelled by Hacker. One of the two "cotypes" noted in Cockerell's description from Pt Lonsdale is housed at the NMV. A distinct clinal size variation in males is present with larger males occurring in Tasmania.

Lasioglossum (Chilalictus) clypeatum sp. nov.

Figures 7E, 21C, 70A–H

Material examined. Holotype, ♀, South Australia, Finniss Creek, W of Maree (29°38′S, 137°30′E), 10–15 Jan 1974, TFH, on *Eucalyptus* (SAM).

Paratypes (16♀♀, 22♂♂). Queensland: 1♂, Betoota (25°42′S, 140°45′E), 10 Aug 1969, EME (UQIC).

New South Wales: 8♂♂, 45 mi (72 km) W of Cobar (31°30′S, 145°28′E), 31 Jan 1971, TFH, on *Brachychiton* (SAM).

South Australia: 1♀, Coward Springs (29°24′S, 136°49′E), May 1981, G.A. Holloway (RODD); 2♀♀, same data as holotype (SAM); 6♀♀, nr N end of Lake Torrens (30°08′S, 137°15′E), Oct 1971, TFH, on *Acacia* (SAM); 4♂♂, nr N end of Lake Torrens (30°09′S, 137°11′E), Oct 1971, TFH, on *Eremophila freelingi* (SAM); 7♀♀, 9♂♂, 1 mi (1.6 km) S of Andamooka HS (30°44′S, 137°12′E), 23 Oct 1971, TFH, on *Hakea* (SAM).

Diagnosis. Clypeal processes unique. Female with head and mesosoma dark brown to black, metasoma light red-brown, clypeus set at distinct angle to frons, ventral margin with large tooth-like processes, inner orbits diverging below, frons striate, pronotal lateral vertical surface with several deep grooves, mesoscutum smooth and highly polished, sparsely punctate with minute punctures, parapsidal line barely impressed, dorsal surface of propodeum rugulose, defined by posterolateral carinae set well below dorsal level, fore tibial spur fan-shaped. Male with head and mesosoma dark brown, metasoma brown, clypeus flat, set at distinct angle to contours of frons, labrum large, as in female, antennae moderately long (FL 1.84 × UID), AS4:AS2+3=1, sternal vestiture sparse, S2–S4 with branched hair across sternites, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.16–4.70 mm ($\bar{x}$=4.44 mm, SD=0.17, n=10), head width 1.48–1.53 mm (n=10), forewing length 0.99–1.08 mm ($\bar{x}$=1.03 mm, SD=0.03, n=10). Relative dimensions: HW 100, HL 74–75, UID 60–61, LID 63–65, AOD 19–20, IAD 14–16, OAD 31–32, IOD 21–22, OOD 14–15, CL 15–17, GW 18–19, EW 25–26, SL 31–32, FL 65–68.

Structure. Head broad, inner orbits diverging below, median frontal carina not reaching median ocellus, eyes with a sparse cover of minute setae. Scape not reaching median ocellus. Clypeus conspicuously short and broad (CL 0.26 × LID), flat, set at distinct angle to contours of frons and supraclypeal area, surface smooth, impunctate and shining, several weak transverse striae along anterior margin, ventral margin with two widely-separated (1.9 × greater than IAD), narrow, rounded, laterally directed processes (fig. 7E), supraclypeal area slightly raised, smooth and impunctate. Frons (fig. 70A) weakly striate/punctate above antennal bases, sculpture laterally weakly punctate, extends vertically well short of anterior margin of lateral ocelli. Labrum (fig. 70B) basal area small, median area smooth and not raised, except anterior median margin slightly raised, distal process triangular in shape except broadly truncate apically, process widest at base, median keel reduced, restricted to basal third of process, lateral ridges absent, setae not present across distal margin, distal setae originate submarginally, lateral teeth absent. Pronotum dorsolateral angles acute, well projected, lateral vertical surface with several deep grooves. Mesoscutum (fig. 70C) anterior margin rounded, punctation fine, entire surface smooth and highly polished, sparsely punctate with minute punctures, parapsidal line barely impressed. Scutellum 1.1 × longer than dorsal surface of propodeum, surface weakly convex, smooth, impunctate and highly polished. Dorsal surface of propodeum (fig. 70C) defined by posterolateral carinae set well below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal sculpture rugulose with a few striae laterally, sculpture almost reaches rim mesially, dorsal rim smooth and polished. T1 closely to densely punctate except posterior marginal area impunctate. Mesepisternum upper third and metepisternum finely roughened, remainder of mesepisternum smooth, polished and impunctate. Fore tibial spur fan-shaped; BP rounded.

Colour. Head and mesosoma dark brown to black, metasoma light red-brown, T1 with large brown mesial patch, mandibles amber, red-brown apically, clypeus light brown, antennal flagellum brown above, light brown underneath, legs with apical third to half of femora, tibiae and tarsi light amber-brown, remainder of legs brown.

Vestiture. Body sparse, lower frons and paraocular areas with conspicuous cover of semi-adpressed, minutely plumose hair, not forming a mat, mesoscutum almost glabrous, metasoma sparsely setose, weak lateral tomentum on T2 and T3.

Description of male. Body length 3.46–3.93 mm ($\bar{x}$=3.69 mm, SD=0.17, n=10), head width 1.20–1.25 mm (n=10), forewing length 0.82–0.92 mm ($\bar{x}$=0.87 mm, SD=0.03, n=10). Relative dimensions: HW 100, HL 77–78, UID 60–61, LID 55–56, AOD 15–16, IAD 16–17, OAD 31–32, IOD 24–25, OOD 14–15, CL 14–15, GW 16–18, EW 33–35, ML 46–48, SL 27–28, FL 110–112.

Structure. Head broad, inner orbits weakly converging below, eyes with sparse cover of minute setae, median frontal carina and scape not reaching median ocellus, clypeus flat, set at distinct angle to contours of frons, anterior half yellow, remainder dark brown, supraclypeal

area flat; labrum distal process same shape as in female, large, truncate, short median keel only, distal setae originate in from margin (fig. 21C). Antennae moderately long (FL 1.84 × UID), AS4:AS2+3=1. Remainder similar to female, frons finely striate, pronotum dorsolaterally rounded, well projected, vertical surface with several large grooves, mesoscutum smooth and highly polished, almost impunctate except with a few sparse, minute punctures, scutellum polished, impunctate, dorsal surface of propodeum not defined by posterolateral carinae, dorsal sculpture weakly rugulose on basal half only, remainder with a dull sheen, covered with fine reticulate pattern; colour of head and mesosoma dark brown, metasoma brown except mandibles, labrum and clypeus (as above) yellow, antennal scape suffused with dull yellow, flagellum light yellow-brown underneath, legs light yellow-brown except coxae dark brown, mid and hind femora suffused with brown; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower frons, paraocular areas, clypeus and supraclypeal area with short, adpressed, plumose hair forming a mat, mesoscutum with cover of short, adpressed and erect, minutely branched hair, mesoventral area hair short, simple and adpressed, metasomal tomentum absent; sternal vestiture sparse, S2–S4 with sparse rows with branched hair across sternites, S5 and S6 with some simple, adpressed hair.

Genitalia and associated sterna (figs 70E–H). Gonobase sides flanged basally, gonocoxite without setae, gonostyli long, apically setose with branched hair, retrorse lobes setose, well developed, ventral flanges present; S8 median process apically broadly rounded and setose, S7 median process rounded and setose apically.

Distribution (fig. 70D). Eyrean province in central South Australia, southwestern Queensland and central western New South Wales.

Etymology. The epithet *clypeatum* refers to the unusual presence of tooth-like processes on the clypeus.

Floral Forage Record. Families visited=5. Catch total=5; Fabaceae (1 catch), Myoporaceae (1), Myrtaceae (1), Proteaceae (1), Sterculiaceae (1). Genera visited=5; *Acacia* (1), *Brachychiton* Schott & Endl. (1), *Eremophila* (1), *Eucalyptus* (1), *Hakea* (1).

Flight Phenology.

3	0	0	0	1	0	0	1	0	4	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum clypeatum demonstrates a number of unique or unusual character states which include: the inner orbits diverging below the head and those of the male converging weakly; the labrum shape, the position of its distal setae and its median keel not reaching distal margin; pronotum with vertical surfaces grooved; and, highly polished mesoscutum sculpture. Unique characters include the tooth-like processes on the anterior margin of the clypeus (female only) and the shape, size and structure of the labrum of the male. Several males show macrocephalic development.

Lasioglossum (Chilalictus) cognatum (Smith)

Figures 17C, 19B, 19D, 25E, 25F, 27F, 71A–H

Halictus cognatus Smith, 1853: 59.

Halictus inclinans Smith, 1879: 36. syn. nov.

Halictus haematostoma Cockerell, 1914a: 506. syn. nov.

Halictus subinclinans Cockerell, 1915a: 8–9. syn. nov.

Lasioglossum (*Chilalictus*) *cognatum*. — Michener, 1965: 175.

Lasioglossum (*Chilalictus*) *inclinans*. — Michener, 1965:176.

Lasioglossum (*Chilalictus*) *haematostoma*. — Michener, 1965: 176.

Lasioglossum (*Chilalictus*) *subinclinans*. — Michener, 1965: 177.

Material examined. Holotype of *cognatus*. ♂, Tasmania (as Van Dieman's Land), BM Type Hym 17.a.900 (BMNH, missing head, right fore and mid legs, hind legs and metasoma glued to card.)

Holotype of *inclinans*. ♀, Western Australia, Champion Bay (28°46′S, 114°36′E), (label reads "Australia"). BM Type Hym 17.a.908 (BMNH, missing distal nine left flagellar segments.)

Holotype of *haematostoma*. ♂, Victoria, Windsor (37°52′S, 144°59′E), French, 196, USNM Type No. 58165 (USNM, missing left antenna, right flagellum and right mid leg, head glued to card and glue covers the entire head.)

Holotype of *subinclinans*. ♀, Tasmania, Launceston (41°26′S, 147°08′E), 15 Feb 1914, collection F.M. Littler, 2568, USNM Type No. 58175 (USNM, missing distal five flagellar segments of left antenna.)

Other specimens examined (763♀♀, 357♂♂). Queensland: Goondiwindi, Inglewood, Rathdowney, Warwick, Eulo, Cunnamulla, Leyburn, Yowah, Thargomindah, Moonie, Helidon, St Ruth, Jondaryan, Kihee, Glenmorgan, Mt Kiangarow, Charleville, Roma, Quilpie, Morven, Thylungra, Windorah, Bundaberg, Blackall, Moura, Bedourie, Boulia, Longreach, Middleton, Prairie, Mt Isa.

New South Wales and Australian Capital Territory: Conargo, Canberra, Jerilderie, Browning, Goulburn,

Cootamundra, Hay, Young, Wentworth, Booligal, Blacktown, Bathurst, Broken Hill, Parkes, Menindee Lakes, Muswellbrook, Warren, Broken Hill, Scone, Trangie, Mendooran, Gilgandra, Nyngan, Wilcannia, Cobar, Coonabarabran, Mootwingee Nat. Pk, Fowlers Gap Res. Stn, Gunnedah, Tilpa, Byrock, Narrabri, Bourke, Glen Innes, Moree, Tibooburra, Legume.

Victoria: Frankston, Nelson, Melbourne, Dunkeld, Clarkefield, Grampians, Glenrowan, Wilkur, Gunbower, Birchip, Kerang, Swan Hill.

Tasmania: Dunalley, Hobart, Cambridge, Launceston, St Helens, Devonport, George Town.

South Australia: West Beach, Naracoorte, Coorong Nat. Park, Keith, Clayton, Normanville, Monarto, Belair, Adelaide, Athelstone, Birdwood, Sandy Creek, Wild Horse Plains, Murray River, Golden Grove, Port Wakefield, Morgan, Kulpara, Loek, Pt Germein, Kyancutta, Lyndhurst, Orroroo, Wilmington, Port Augusta, Quorn, Mingary, Lake Torrens, Martins Well, Wilpena, Brachina Ck, Parachilna, Roxby Downs, Broughams Gate, Moolawatana, Roxby Downs, Leigh Creek, Myrtle Springs HS, Arkaroola, Billa Kalina HS, Marree, Coward Springs, William Creek, Etadunna HS, Cullymarra Waterhole, Coongie Lakes, Amata, Kangaroo Island, Victor Harbour, Poltalloek Station, Williamstown.

Northern Territory: Finke, Urandangi, Dunmarra, Borroloola.

Western Australia: Pemberton, Kojonup, Busselton, Cape Lewin, Bunbury, Lake King PO, Lake Cronin, Darlington, Merredin, Northam, Moorine Rock, Carnarvon, Newman, Millstream.

Diagnosis. Combination of wing, mesoscutal punctation and colour characters unique. Both sexes with head and propodeum black, mesoscutum and scutellum shades of green to blue. Female with frons reticulate, mesoscutum punctation moderately coarse, surface dull, dorsal surface of propodeum ruguloso-striolate, defined by weak posterolateral carinae, forewing with 1st m-cu entering third submarginal cell. Male with antennae short, AS4 shorter than AS2+3, S2 with raised, mesial process, process smooth sided, truncate, with at least 6 lateral spines, hair on S3–S5 forming inverted V shape, forewing with 2nd r-m weaker than 1st r-m.

Description of female. Body length 5.62–6.93 mm ($\bar{x}$=6.39 mm, SD=0.33, n=10), head width 1.76–1.91 mm (n=10), forewing length 1.41–1.64 mm ($\bar{x}$=1.55 mm, SD=0.06, n=10). Relative dimensions: HW 100, HL 84–86, UID 63–64, LID 56–58, AOD 17–18, IAD 12–13, OAD 30–32, IOD 20–22, OOD 17–18, CL 18–20, GW 18–19, EW 25–26, SL 33–35, FL 59–63.

Structure. Head broad, inner orbits converging below, median frontal carina not reaching median ocellus, eyes sparsely covered with minute setae. Scape reaching anterior margin of median ocellus. Clypeus short (CL 0.34 × LID), flat except convex laterally and along ventral margin, shining on basal half, remainder dull with minute, transverse lineolation, sparse to open punctation with small, round punctures, supraclypeal area almost confluent with clypeal angle, weakly bulbous, surface dull, openly to closely punctate. Frons (fig. 71A) densely reticulate above antennal bases, sculpture laterally weakens, extends to anterior margin of lateral ocelli. Labrum (fig. 71B) basal median area raised to distal margin, nodulated, anterior margin rounded mesially, distal process not widest at base, distally flanged, median keel extends beyond distal margin, lateral ridges curved, dorsally smooth, almost extend to margin, distal margin setose, lateral teeth absent. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 71C) anterior margin with weakly bilobed mesial projection, punctation moderately coarse, surface dull, anteriorly with fine transverse lines, along midline and in parapsidal areas densely punctate, openly to closely punctate mesially. Scutellum 1.3 × longer than dorsal surface of propodeum, surface dull, openly to closely punctate. Dorsal surface of propodeum (fig. 71C) defined by weak posterolateral carinae set well below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal sculpture ruguloso-striolate mesially, striolate laterally, sculpture almost reaches dorsal rim. T1 densely punctate. Mesepisternum and metepisternum striate. BP rounded; Fore basitarsi apically with process almost length of adjacent tarsal segment (fig. 17C); forewing with 1st m-cu entering third submarginal cell, M+Rs vein strong to entry point of 1st recurrent vein (fig. 19B).

Colour. Head and propodeum black except mandibles red-brown apically, basal half of clypeus and supraclypeal area green/blue with tinge of gold; mesoscutum and scutellum shades of green to blue, along midline and parapsidal lines tinged with gold; metasoma dark brown to black; legs brown to dark brown.

Vestiture. Body sparse, paraocular areas and frons with short, adpressed, branched hair, hair on frons almost simple, mesoscutum with erect, weakly, branched hair, lateral tomentum on T2, across T3 and T4.

Description of male. Body length 4.00–6.08 mm ($\bar{x}$=5.15 mm, SD=0.63, n=10), head width 1.34–1.93 mm (n=10), forewing length 1.01–1.48 mm ($\bar{x}$=1.26 mm, SD=0.12, n=20).

Relative dimensions: HW 100, HL 88–89, UID 66–67, LID 46–48, AOD 15–16, IAD 14–15, OAD 28–30, IOD 21–23, OOD 19–20, CL 21–23, GW 17–18, EW 32–33, ML 38–39, SL 28–29, FL 83–85.

Structure. Head elongate, inner orbits converging below, eyes appear bare, few minute setae, clypeus with pale yellow marking on at least basal half, sculpture similar to female except clypeus almost impunctate. Antennae short (FL 1.27 × UID), AS4:AS2+3=0.6. Remainder of body similar to female but with mesoscutum and scutellum surfaces shining, mesoscutum openly punctate, scutellum sparsely punctate, dorsal surface of propodeum not defined by carinae, fore basitarsi not extended, S2 with conspicuously raised, median process, process smooth sided, truncate, with 6 lateral spines (figs 25E, 25F); forewing with 2nd r-m weaker than 1st r-m (fig. 19D).

Vestiture. Body sparse, frons, paraocular areas, supraclypeal area, basal two-thirds of clypeus with dense, short, branched, adpressed hair forming a mat, mesoscutum, covered with erect, branched hair; S3–S5 with posteriorly directed, plumose hair forming inverted V-shape (fig. 27F).

Genitalia and associated sterna (figs 71E–H). Gonobase sides slightly narrowed basally, gonocoxite without setae, gonostyli setae short, both branched and simple hair present, apically with several stout, elongate spine-like setae, retrorse lobes setose, well developed, ventral flanges present; S8 median process apically rounded, with a few simple setae, S7 median process apically rounded, glabrous.

Distribution (fig. 71D). Throughout much of Australia, including Cape York Peninsula, Northern Territory and northeast Western Australia but not the Torresian province areas of north Queensland. In southern Australia, the species distribution follows the eastern zone only of the Bassian province.

Flight Phenology.

34	14	11	5	2	0	0	1	30	58	73	47
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Floral Forage Record. Families visited=35. Catch total=164; Aizoaceae (3 catches), Anacardiaceae (4), Brassiaceae (1), Boraginaceae (2), Brunoniaceae (1), Campanulaceae (24), Chenopodiaceae (1), Combretaceae (1), Compositae (12), Convolvulaceae (2), Cruciferae (5), Dilleniaceae (1), Fabaceae (8), Frankeniaceae (2), Goodeniaceae (4), Labiatae (2), Liliaceae (2), Menyanthaceae (1), Myoporaceae (7), Myrtaceae (48), Oxalidiaceae (4), Papaveraceae (1), Pittosporaceae (1), Plumbaginaceae (2), Polygonaceae (1), Primulaceae (1), Proteaceae (4), Resedaceae (1), Rhamnaceae (1), Rosaceae (2), Santalaceae (1), Sapindaceae (3), Scrophulariaceae (9), Solanaceae (1), Zygophyllaceae (2). Genera visited=63; unidentified genus of Compositae (1), *Acacia* (2), *Anthirrhinum* Moench (1), *Argemone* L. (1), *Argyranthemum* Webb ex Sch. Bip. (1), *Asphodelus* L. (1), *Atalaya* (3), *Borago* L. (1), *Brassica* (1), *Brunonia* Sm. (1), *Bulbine* v. Wolf (1), *Bursaria* (1), *Cakile* Mill. (2), *Calystegia* R.Br. (2), *Calytrix* (1), *Carpobrotus* (2), *Chrysanthemum* L. (1), *Coreopsis* L. (1), *Cotinus* Mill. (1), *Crotalaria* L. (3), *Eremophila* (7), *Eucalyptus* (38), *Frankenia* (2), *Geum* (1), *Goodenia* (2), *Grevillea* (1), *Hakea* (3), *Harmsiodoxa* O.E. Schultz (1), *Helichrysum* (2), *Heliotropium* L. (1), *Hibbertia* (1), *Jacksonia* (1), *Leptospermum* (2), *Limonium* Mill. (2), *Melaleuca* (7), *Mesembryanthemum* (1), *Muehlenbeckia* Mesinn. (1), *Myriocephalus* (1), *Nitraria* (1), *Nymphoides* Seguier (1), *Oxalis* L. (4), *Potentilla* L. (1), *Prostanthera* (1), *Psoralea* L. (1), *Pultenaea* (1), *Rapistrum* Crantz. (1), *Reseda* L. (1), *Salsola* (1), *Samolus* L. (1), *Santalum* L. (1), *Schinus* (3), *Senecio* (1), *Solanum* (1), *Solidago* L. (1), *Spyridium* Fenzl. (1), *Stemodia* (7), *Taraxacum* (3), *Terminalia* (1), *Thymus* L. (1), *Velleia* (2), *Veronica* L. (1), *Wahlenbergia* (24), *Zygophyllum* (1).

Remarks. The floral foraging record of *L. cognatum* is the most diverse recorded for a species of this subgenus (visits to 35 flowering plant families representing 63 genera). Three male specimens from central New South Wales and southeastern Queensland display macrocephaly.

Lasioglossum (Chilalictus) colonicum (Rayment)

Figures 11A, 72A–D

Halictus colonicus Rayment, 1953: 12–13.

Lasioglossum (*Chilalictus*) *colonicum.* — Michener, 1965: 175*Material examined.* Holotype, ♀, Victoria, Gorae West (38°15′S, 141°30′E), 7 Feb 1951 (ANIC, missing distal three segments of left fore tarsus, last tarsal segment of mid right tarsus, last two tarsal segments of both hind tarsi.)

Other specimens examined (8♀♀). Victoria: Gorae West.

South Australia: Robe, Kangaroo Island.

Western Australia: Darling Ranges.

Diagnosis. Most like *L. ebeneum*, although

mesoscutal sculpture unlike any other species. Female with body black, frons coarsely reticulate, clypeus polished, mesoscutum punctation conspicuously coarse, densely punctate, dorsal surface of propodeum broadly reticulate, defined by posterior carinae raised forming ridge, T1 polished.

Description of female (male unknown). Body length 8.24–8.86 mm ($\bar{x}$=8.64 mm, SD=0.26, n=6), head width 2.23–2.52 mm (n=6), forewing length 2.00–2.21 mm ($\bar{x}$=2.08 mm, SD=0.09, n=6). Relative dimensions: HW 100, HL 82–84, UID 62–63, LID 55–57, AOD 20–21, IAD 10–11, OAD 26–28, IOD 18–19, OOD 16–17, CL 20–21, GW 19, EW 24–25, SL 38, FL 66–68.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, upper portion of carina weak, eyes sparsely covered with minute setae. Scape reaching anterior margin of lateral ocelli. Clypeus short (CL 0.37 × LID) convex, polished over entire surface, basal margin smooth, few small punctures, remainder closely punctate with large, circular punctures, supraclypeal area projected, shining mesially, remainder dull, densely punctured. Frons (fig. 72A) reticulate above antennal bases and laterally to margins of inner orbits, sculpture extends to posterior margin of lateral ocelli. Labrum (fig. 72B) basal median area raised, irregularly roughened, with several setae, lateral areas weakly recessed, anterior margin bluntly obtuse mesially, distal process small, not tapered, widest at base, sides almost parallel, median keel spatulate, extends beyond distal margin, lateral ridges weakly serrate, extend to setose distal margin, lateral teeth small teeth, not hooked. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 72C) anterior margin with weak mesial projection, punctation conspicuously coarse, surface dull except small posteromesial area with interspaces smooth and shining, anterolateral corners scabrous, remainder densely punctate with large, contiguous punctures, posteromesially closely punctate. Scutellum 1.43 × longer than dorsal surface of propodeum, densely punctate except small mesial area openly punctate and shining. Dorsal surface of propodeum (fig. 11A) defined by posterior carinae set at dorsal level, carinae raised forming distinct ridge, posterovertical carinae reach dorsal carinae, dorsal sculpture coarsely reticulate mesially, ruguloso-striate laterally, sculpture reaching dorsal rim. T1 highly polished, basal area openly punctured, posterior marginal area sparsely punctate to impunctate along posterior margin with small punctures. Mesepisternum and metepisternum coarsely striate. BP obtuse.

Colour. Body black except mandibles light brown, apically red-brown, clypeus, antennae, metasomal segments tinged with brown, legs light brown.

Vestiture. Body moderately covered, head and mesoscutum with long, erect, branched hair, S2 and S3 with long, erect, weakly, branched hair; tomentum present laterally on T2 and T3.

Distribution (fig. 72D). Coastal regions of southwestern Victoria and southeastern South Australia, including Kangaroo Island; single specimen from the Darling Range, Western Australia (see *Remarks*).

Floral Forage Record. Families visited=3. Catch total=3; Cruciferae (1 catch), Epacridaceae (1), Leguminosae (1). Genera visited=3; *Acacia* (1), *Cakile* (1), *Leucopogon* (1).

Flight Phenology.

2	1	0	0	0	0	0	0	0	1	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The sculpture on the frons, mesoscutum and propodeum is the most coarse observed within the subgenus. The label on the holotype (Glenelg River, 16 Dec 1950, Clifford Beaglehole) differs from the published data which is cited above. Rayment was renowned for his lack of curatorial detail and as the specimen matches the published description, I have no doubt in considering it as the holotype.

The single specimen from Western Australia (Darling Range) has been tentatively associated with this species as it has similar frons and propodeal characters. The mesoscutal sculpture on this specimen is weaker than that found on eastern specimens and the mesoscutal posteromesial area is smooth and shining.

Lasioglossum (Chilalictus) conspicuum (Smith)

Figures 11B, 73A–H

Halictus conspicuus Smith, 1879: 34.

Halictus alboguttatus Friese, 1924: 241, syn. nov.

Lasioglossum (*Chilalictus*) *conspicuum*. — Michener, 1965: 175.

Lasioglossum (*Chilalictus*) *alboguttatum*. — Michener, 1965: 175.

Material examined. Holotype of *conspicuus*, ♀, Australia (66,64 on round blue label), BM Type Hym. 17.a.970, (BMNH).

Holotype of *alboguttatus*, ♀, C. Australia, leg. von Muller, 93, orange "TYPUS" label, Am. Mus. Nat.

Hist. Dept. Invert. Zool. No. 26902 (AMNH, missing left fore and hind tarsi, except hind basitarsus; left mid tibia and tarsi glued to left mid femur; right fore tarsi, except basitarsus, mid and hind legs, except hind coxae; right forewing torn and folded apically).

Other specimens examined (93♀♀, 11♂♂). Queensland: Rockhampton, Springsure, Childers, Biggenden, MacLagan, Fernvale, Brisbane, Lawes, Mutdapilly, Noecundra, Leyburn, Warwick, Eulo, Mt Lindesay, Goondiwindi.

New South Wales: Tooloom, Moree, Walgett, Fowlers Gap Res. Stn, Warren, Kinchega Nat. Pk.

Victoria: Kerang, Gunbower.

South Australia: Port Pirie.

Diagnosis. Most like *L. speculatum*. Both sexes with body black. Female with frons coarsely reticulate, clypeus shining, mesoscutum punctation moderately coarse, dorsal surface of propodeum striolate, defined by posterolateral carinae. Male with antennae moderately long, S2–S4 with long, plumose hair across sterna, S5 with long, plumose hair directed laterally to form lateral tufts; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.31–8.93 mm ($\bar{x}$=8.26 mm, SD=0.35, n=20), head width 2.16–2.54 mm (n=20), forewing length 2.11–2.46 mm ($\bar{x}$=2.28 mm, SD=0.08, n=20). Relative dimensions: HW 100, HL 78–81, UID 56–59, LID 56–58, AOD 20–22, IAD 10–12, OAD 23–25, IOD 15–17, OOD 13–14, CL 20–21, GW 13–19, EW 23–26, SL 41, FL 71–74.

Structure. Head broad, inner margin of orbits parallel to slightly converging above, median frontal carina reaches median ocellus, eyes sparsely covered with minute setae. Scape reaching beyond lateral ocelli. Clypeus short (CL 0.37 × LID), convex, shining except along anterior margin some transverse lineolation, closely punctured, supraclypeal area weakly protruded, shining mesially remainder microtessellate, closely punctured. Frons (fig. 73A) coarsely reticulate to punctate above antennal bases and laterally, sculpture extends to level of anterior margin of lateral ocelli. Labrum (fig. 73B) basal median area raised to distal margin, surface roughened, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges serrate, extend to non-setose distal margin, lateral teeth large distally hooked. Pronotum dorsolateral angles obtuse and projecting. Mesoscutum (fig. 73C) anteriorly with weakly bilobed mesial projection, punctation moderately coarse, mesially open to closely punctured with interspaces spaces shining, densely punctured in parapsidal areas. Scutellum 1.25 × longer than dorsal surface of propodeum, median line weakly impressed densely punctured, laterally shining, open to sparsely punctured. Dorsal surface of propodeum (fig. 11B) defined by posterolateral carinae set well below dorsal surface, carinae almost meet mesially, posterovertical surface transversely plicate, carinae reaches dorsal carinae, dorsal sculpture striolate just reaching rim, rim recessed mesially. T1 densely punctured. Mesepisternum with strong transverse striae, metepisternum on upper half with horizontal striae, remainder smooth; BP rounded.

Colour. Body black (in some fresh specimens, including type, body light brown), mandibles and tegula dark red-brown, pedicle, flagellar segments and apical 0.3 of tergites brown, coxae, trochanters and femora except apical rim (knee) dark brown, remainder of legs, including knees, light red-brown in some specimens, others with legs entirely dark brown to black.

Vestiture. Body sparse, head and mesoscutum with erect, minutely branched hair, white lateral tomentum on T2–T4.

Description of male. Body length 6.85–6.93 mm ($\bar{x}$=6.89 mm, SD=0.06, n=2), head width 1.93–2.16 mm (n=3), forewing length 1.67–1.90 mm ($\bar{x}$=1.77 mm, SD=0.12, n=3). Relative dimensions: HW 100, HL 87–88, UID 60–62, LID 47–48, AOD 17–18, IAD 13–14, OAD 24–26, IOD 18–20, OOD 14–15, CL 22–23, GW 16–18, EW 25–28, ML 40–41, SL 28–29, FL 115–118.

Structure. Head broad, inner orbits converging below, eyes with sparse, minute setae, sculpture similar to female except scape just reaching median ocellus, clypeus slightly convex, weak, open punctures, basal three-quarters with dull yellow marking, supraclypeal area weakly protruded, shining, closely punctured. Antennae moderately long (FL 1.85 × UID), AS4:AS2+3=1. Remainder of body similar to female including variations in leg colour; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Similar to female except face with dense, adpressed, plumose hair; S2–S4 with long, plumose hair across sterna S5 with long, plumose hair directed laterally to form lateral tufts.

Genitalia and associated sterna (figs 73E–H). Gonobase sides flanged basally, gonocoxite setose on apical inner margin, gonostyli setae long, both branched and simple present, retrorse lobes well developed, setose, ventral flanges absent; S8 median process rounded, with simple

setae, S7 median process rounded, setae present on lateral margins.

Distribution (fig. 73D). Eastern zone (except Tasmania) of the Eyrean and Bassian provinces; appears to prefer inland conditions except in south eastern Queensland where the species almost reaches the coast.

Floral Forage Record. Families visited=4. Catch total=16; Anacardiaceae (1 catch), Fabaceae (1), Myrtaceae (13), Sapindaceae (1). Genera visited=5; *Acacia* (1), *Atalaya* (1), *Eucalyptus* (10), *Melaleuca* (3), *Schinus* (1).

Flight Phenology.

1	0	2	0	1	0	1	0	7	6	12	6
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Intraspecific variation is restricted to leg colour differences in both sexes. The conspecificity of colour variants was confirmed by examination of male genitalia.

Lasioglossum (Chilalictus) convexum (Smith)

Figures 74A–H

Halictus convexus Smith, 1879: 35.

Halictus griseovittatus Cockerell, 1914a: 509. syn. nov.

Halictus bursariae Cockerell, 1916a: 203. syn. nov.

Halictus mjobergi Friese, 1917: 5. syn. of *griseovittatus* by Cockerell, (1929: 13).

Halictus euryurus Cockerell, 1930: 44. syn. nov.

Lasioglossum (*Chilalictus*) *convexum*. — Michener, 1965: 175.

Lasioglossum (*Chilalictus*) *griseovittatum*. — Michener, 1965: 176.

Lasioglossum (*Chilalictus*) *bursariae*. — Michener, 1965: 175.

Lasioglossum (*Chilalictus*) *mjobergi*. — Michener, 1965: 177.

Lasioglossum (*Chilalictus*) *euryurum*. — Michener, 1965: 176.

Material examined. Holotype of *convexus*. ♀, Australia, Victoria. BM Type Hym. 17.a.902 (BMNH, missing right flagellum, right hind tarsal segments and left femur, tibia and tarsal segments.)

Holotype of *griseovittatum*. ♀, Queensland, Brisbane, Kelvin Grove (27°27′S, 153°00′E), 15 Jan 1912, H. Hacker, 27, USNM Type No. 27763 (USNM).

Holotype of *bursariae*. ♂, Queensland, Brisbane, Kelvin Grove (27°27′S, 153°00′E), 10 Jan 1913, H. Hacker, 93, on *Bursaria spinosa* (ANIC).

Holotype of *mjobergi*. ♀, Queensland, Mt Tamburine (sic) (27°55′S, 153°09′E) in October and from Atherton. Leg. Mjöberg (Presumed in AMNH though not located).

Holotype of *euryurus*. ♂, New South Wales, New Adaminaby (36°00′S, 148°47′E), 19 Oct 1918, A.J. Turner, Type T.4102 (QM, missing antennae, metasoma dislodged and placed in plastic vial attached to pin.)

Other specimens examined (94♀♀, 50♂♂). Queensland: Glen Aplin, National Park, Leyburn, Mt Tambourine, Acacia Ridge, Mt Cootha, Brisbane, Mt Nebo, Bunya Mts, Maidenwell, Bin Bin Range, Maryborough, Eidsvold, Bundaberg, Mackay, Atherton.

New South Wales and Australian Capital Territory: Nadgee Reserve, Merrika Lodge, Narooma, Adaminaby, Canberra, Jamberoo, Sydney, Coonabarabran, Mt Kaputar, Legume.

Victoria: Melbourne, Nowa Nowa, Stawell, Glen Wills, Biggara, Wilkur, Gunbower, Kerang.

Tasmania: Wedge Island, Betsey Island, Orford, George Town.

South Australia: Cape Jervis, Monarto, Mt Lofty, Mannum, Gilberton, Athelstone, Port Lincoln, Oodla Wirra, Tandaie Rockholes.

Diagnosis. Most like *L. victoriellum*. Both sexes black. Female with frons coarsely striate, frontal carina reaches median ocellus, mesoscutum densely punctate, dorsal surface of propodeum ruguloso-striolate, not defined by carinae. Male with antennae moderately long (FL 1.94 × UID), AS4:AS2+3=1, S2–S4 with long, plumose hair across sternites, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.01–7.08 mm ($\bar{x}$=6.60 mm, SD=0.40, n=10), head width 1.83–2.21 mm (n=10), forewing length 1.69–1.93 mm ($\bar{x}$=1.80 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 82–84, UID 58–60, LID 51–54, AOD 20–22, IAD 9–11, OAD 26–27, IOD 16–17, OOD 15–17, CL 20–22, GW 16–18, EW 23–25, SL 38–40, FL 70–72.

Structure. Head broad, though distinctly triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.41 × LID), weakly convex, surface shining, basally with large, deeply impressed, irregular shaped punctures, posteriorly with a few small, rounded, shallow punctures, supraclypeal area weakly projected, shining except dull around margin, openly to closely punctate with small, rounded punctures. Frons (fig. 74A) coarsely striate above antennal bases, striae forming wavy lines and curved mesially to meet along frontal carina, sculpture laterally weakens to punctate, extends vertically to posterior margin of lateral ocelli. Labrum (fig. 74B) basal median area raised, weakly ridged, anterior margin rounded mesially, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges prominent, dorsally

smooth, extend to margin, setae not present across distal margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles rounded, well projected. Mesoscutum (fig. 74C) anterior margin with rounded mesial projection, punctation coarse, surface shining except anteriorly dull and impunctate, remainder densely punctate, punctures along midline and in parapsidal areas almost contiguous, mesially with distinct interspaces present. Scutellum 1.4 × longer than dorsal surface of propodeum, surface shining, sparsely to openly punctate. Dorsal surface of propodeum (fig. 74C) not defined by carinae, posterovertical carinae extends less than halfway to dorsal level, dorsal sculpture rugulosostriolate on basal half to two-thirds, a few weak striae laterally extending to rim, dorsal rim smooth, with a dull sheen, gently slopes onto vertical surfaces. T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum on upper half striate, remainder smooth. BP rounded.

Colour. Body black except mandibles redbrown apically, antennal flagellum brown underneath, legs and metasomal posterior marginal areas suffused with brown.

Vestiture. Body sparse, frons and paraocular areas with erect, branched hair, clypeus with a few erect, minutely branched to simple hairs, mesoscutum with short, erect, branched hair, metasomal tomentum laterally on T2, across T3–T5.

Description of male. Body length 5.62–6.54 mm ($\bar{x}$ = 5.89 mm, SD = 0.30, n = 10), head width 1.77–1.88 mm (n = 10), forewing length 1.36–1.62 mm ($\bar{x}$ = 1.50 mm, SD = 0.10, n = 10). Relative dimensions: HW 100, HL 88–91, UID 63–66, LID 48–49, AOD 17–18, IAD 14–15, OAD 26–27, IOD 19–20, OOD 18–19, CL 22–23, GW 20–23, EW 26–28, ML 38–39, SL 32–35, FL 120–122.

Structure. Head triangular, inner orbits converging below, eyes with sparse cover of minute setae, scape not reaching median ocellus, clypeus almost flat, slightly convex, basally pale white/yellow marking, shining, densely punctate with shallow punctures, supraclypeal area projected, shining, openly punctate. Antennae modcrately long (FL 1.94 × UID), AS4:AS2 + 3 = 1. Rcmainder of body similar to female except mesoscutum mesial punctation openly to closely punctate, dorsal surface of propodeum striolate, dorsal rim polished; colour similar to female in some specimens metasoma brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, lower paraocular areas with some short, adpressed plumose hair, not forming a mat, frons with some erect, branched hair, metasomal tomentum laterally on T2 and T3, S2–S4 with long, plumose hair across sternites, S5 and S6 with short, adpressed simple hair.

Genitalia and associated sterna (figs 74E–H). Gonobase sides slightly narrowed basally, gonocoxite with dorsal and lateral setae, gonostyli long with dense cover of long branched hairs, retrorse lobes sparsely setose, well developed, ventral flanges present, penis valves broad basally; S8 median process broadly truncate apically, with a few setae, S7 median process rounded, glabrous.

Distribution (fig. 74D). Eastern zone of the Bassian province with a few north Queensland localities.

Floral Forage Record. Families Visited- 10. Catch Total- 21. Compositae (1 catch), Cruciferae (1), Dilleniaceae (1), Fabaceae (5), Myrtaceae (6), Oxalidiaceae (1), Pittosporaceae (3), Proteaceae (1), Solanaceae (1), Xanthorrhoeaceae (1). Genera Visited- 16. (Unidentified Fabaceae genera) (2), *Bursaria* (2), *Cakile* (1), *Cheiranthera* Endl. (1), *Eucalyptus* (2), *Hakea* (1), *Hibbertia* (1), *Jacksonia* (2), *Kunzea* (1), *Leptospermum* (2), *Melaleuca* (1), *Oxalis* (1), *Pultenaea* (1), *Solanum* (1), *Taraxacum* (1), *Xanthorrhoea* (1).

Flight Phenology.

11	5	6	3	2	0	0	4	2	16	7	16
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. There is some confusion about the type locality of *Halictus mjobergi*. Friese (1917) listed the type localities as Mt Tamburine (sic Tamborine) and Atherton. These two localities are far apart in southeastern and northeastern Queensland respectively. Cockerell (1929) synonymised *H. mjobergi* with *Halictus griseovittatus* and noted the speeimen was labelled "Adelaide". This speeimen was in the AMNH but can no longer be located.

Lasioglossum (Chilalictus) copleyense sp. nov.

Figures 75A–H

Material examined. Holotype. ♀, South Australia, 10 km W of Copley (30°33′S, 138°20′E), 27 Oct 1990, KLW, on *Frankenia* (NMV T-15553).

Paratypes. 1♀, 1♂, same data as holotype (NMV ♀ T-15554, ♂ T-15555)

Diagnosis. Like *L. bubrachium*. Female with

head and mesosoma black, metasoma red-brown except T1 with broad dark marking on anterior two thirds, frons striate, pronotal dorsolateral angles not projected, mesoscutum dull, covered with fine reticulate pattern, openly punctate, dorsal surface of propodeum defined by weak posterolateral carinae, fore tibial spur fan shaped. Male with body dark metallic green, mesoscutum with slight copper tinge, antennae moderately long (FL 1.57 × UID), AS4: AS2+3=0.6, S2–S4 with cover of long, posteriorly directed, branched hair, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.31–4.39 mm (n=2), head width 1.34–1.36 mm (n=2), forewing length 0.99–1.01 mm (n=2). Relative dimensions: HW 100, HL 75–76, UID 60–61, LID 52–53, AOD 20–21, IAD 14–15, OAD 31–32, IOD 25–26, OOD 14–15, CL 19–20, GW 16–17, EW 27–28, SL 34–35, FL 74–75.

Structure. Head triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with a sparse cover of minute setae. Scape just short of reaching anterior margin of median ocellus. Clypeus short (CL 0.38 × LID), gently convex, more so along ventral margin, entire surface dull covered with a fine reticulate pattern, impunctate though a few broad, shallow depressions anteromesially, supraclypeal area flat, dull, impunctate. Frons (fig. 75A) finely striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to just short of anterior margin of lateral ocelli. Labrum (fig. 75B) median basal area forming V-shaped tubercles, anterior margin rounded mesially, forming raised lip, distal process triangular, widest at base, median keel extends to distal margin, lateral ridges enlarged, extend to lateral margin, setae not present across margin, lateral teeth absent. Pronotum dorsolateral angles rounded, not projected. Mesoscutum (fig. 75C) anterior margin rounded, punctation fine, surface dull, entirely covered with fine reticulate pattern, openly punctate with small, rounded shallow punctures mesially and in parapsidal areas. Scutellum length equal to length of dorsal surface of propodeum, surface dull mesially, shining laterally, impunctate except a few punctures along midline. Dorsal surface of propodeum (fig. 75C) defined by weak posterolateral carinae set well below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal sculpture weakly ruguloso-striolate, not reaching dorsal rim, rim dull, gently rounded. T1 impunctate. Mesepisternum and metepisternum dull covered with a fine reticulate pattern. Fore tibial spur fan-shaped; BP broadly rounded.

Colour. Head and mesosoma black, metasoma red-brown except T1 with broad dark marking on anterior two-thirds, mandibles amber, red-brown apically, antennal flagellum light brown underneath, legs brown except fore and mid tibiae and tarsi light red-brown.

Vestiture. Body sparse, frons and paraocular areas with some erect, minutely branched hair, mesoscutum with sparse cover of similar, shorter hair, metasomal tomentum absent.

Description of male. Body length 3.69mm, head width 1.22mm, forewing length 0.89mm. Relative dimensions: HW 100, HL 84, UID 68, LID 54, AOD 18, IAD 16, OAD 32, IOD 27, OOD 15, CL 20, GW 17, EW 29, ML 41, SL 30, FL 107.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, clypeus weakly convex with ventral margin slightly concave, surface smooth and shining, appear impunctate though with a few indistinct shallow punctures, anterior half white/pale yellow, supraclypeal area flat, shining, impunctate. Antennae moderately long (FL 1.57 × UID), AS4:AS2+3=0.6. Remainder similar to female, frons finely striate, pronotum dorsolateral angles rounded, not projected, mesoscutum dull, covered with fine reticulate pattern, sparsely punctate with small, rounded, shallow punctures, scutellum with a dull sheen, impunctate, dorsal surface of propodeum defined by angular posterolateral carinae, dorsal sculpture ruguloso-striolate, dorsal rim polished; colour of body dark metallic green, mesoscutum with slight copper tinge, mandibles white/yellow, red-brown apically, legs with apical half of fore and mid femora, apical third of hind femora and all tibiae red-brown, tarsi dull white/yellow, remainder dark green; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower half of frons, paraocular areas, across basal one third of clypeus and supraclypeal area densely covered with short, adpressed, minutely plumose hair forming a mat, upper half of frons erect, branched hair, mesoscutum with moderate cover of erect, branched hair, weak metasomal tomentum on T2 and T3; S2–S4 with moderate cover of long, posteriorly directed, branched hair, S5 and S6 with similar hair though less dense.

Genitalia and associated sterna (figs 75E–H). Gonobase sides parallel, gonocoxite without

setae, gonostyli long, with branched hair dorsally and apically, retrorse lobes well developed, glabrous, ventral flanges present; S8 median process rounded and with branched hair apically, lateral margins broadened, S7 median process elongated and narrow, a few hairs apically.

Distribution (fig. 75D). South Australia: Copley (known from type locality only).

Etymology. The epithet *copleyense* refers to the type locality.

Floral Forage Record. Family visited and Catch total=1; Frankeniaceae (1 catch). Genus visited. *Frankenia* (1).

Flight Phenology.

0	0	0	0	0	0	0	0	0	1	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Lasioglossum (Chilalictus) demicapillum sp. nov.

Figures 25D, 76A–H

Material examined. Holotype, ♀, Queensland, 2 mi (3.2 km) S of Nanango (26°40′S, 152°00′E), 7 Oct 1968, TFH, on *Wahlenbergia* (SAM).

Paratypes (10♀♀, 4♂♂). Queensland: 5♀♀, same data as holotype (SAM); 1♂, Horse Gully, foot of Bunya Mts (26°42′S, 150°31′E), 7 Oct 1984, IDN & JCC (ANIC); 2♀♀, 3♂♂, Bunya Mts (26°51′S, 151°34′E), 8 Oct 1968, TFH, on *Wahlenbergia* (SAM); 2♀♀, 4 mi (6.4 km) E of Fernvale (27°27′S, 152°39′E), 7 Apr 1967, TFH, on *Wahlenbergia* (SAM); 1♀, 2 mi N Wallangarra (28°55′S, 151°56′E), 25 Jan 1968, TFH, on *Wahlenbergia* (SAM).

Diagnosis. Most like *L. humei*. Both sexes black. Female with frons striate, mesoscutum surface dull, openly to closely punctate, mesoventral area with hair branched only on anterior side of hair shaft, dorsal surface of propodeum ruguloso-striolate on basal half, not defined by posterovertical carinae. Male with clypeus black, antennae moderately long (FL 1.7 × UID), AS4:AS2+3=0.6, S2 mesial posterior margin and mesially across S3 surface with short, erect, plumose hair, S2 hair posteriorly directed, S3 hair mesially directed forming small, erect tuft at midpoint, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.39–4.77 mm ($\bar{x}$=4.53 mm, SD=0.12, n=10), head width 1.36–1.46 mm (n=10), forewing length 1.13–1.27 mm ($\bar{x}$=1.21 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 82–84, UID 64–65, LID 52–53, AOD 17–18, IAD 13–14, OAD 30–31, IOD 18–19, OOD 20–21, CL 19–20, GW 14–15, EW 29–30, SL 36–38, FL 68–70.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, upper half of carina weak, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.38 × LID), weakly convex, surface dull with conspicuous reticulate pattern, appears impunctate but with a few shallow, broad, rounded punctures, supraclypeal area weakly projected, dull, impunctate. Frons (fig. 76A) striate above antennal bases, more so on lower half of frons with striae meeting at oblique angle along median frontal carina, sculpture laterally weakens to punctate, extends vertically almost to anterior margin of lateral ocelli. Labrum (fig. 76B) median basal area conspicuously raised, coarsely roughened with irregular ridges, lateral areas weakly recessed, distal process not tapered, widest at base, median keel weakly spatulate, extends to distal margin, lateral ridges absent, setae not present across margin, distal setae originate submarginally, lateral teeth large, distally hooked. Pronotum dorsolateral angles rounded, weakly projected. Mesoscutum (fig. 76C) anterior margin rounded, punctation fine, surface dull, anteriorly impunctate, remainder with small, shallow punctures, openly to closely punctate mesially and parapsidal areas, laterad of parapsidal lines closely to densely punctate. Scutellum 1.4 × longer than dorsal surface of propodeum, surface dull, closely to densely punctate with punctures similar to mesoscutal punctures. Dorsal surface of propodeum (fig. 76C) not defined by posterovertical carinae, posterovertical carinae extends less than half way to dorsal level, dorsal sculpture weakly ruguloso-striolate on basal half, laterally a few striae, dorsal surface dull, dorsal rim bluntly obtuse. T1 densely punctate. Mesepisternum and metepisternum of upper half only striate. BP rounded.

Colour. Body black except mandibles red-brown apically, antennal flagellum light brown underneath, metasoma with posterior marginal areas and legs suffused with brown.

Vestiture. Body sparse, frons, paraocular areas and clypeus with erect, minutely branched hair, mesoscutum with short, simple adpressed and sparse erect, minutely branched hair, mesoventral area with hair branched only on anterior side of hair shaft (fig. 25D), metasomal tomentum laterally on T2, across T3 and T4.

Description of male. Body length 4.08–4.47 mm

($\bar{x}$=4.30 mm, SD=0.17, n=4), head width 1.41–1.48 mm (n=10), forewing length 1.18–1.20 mm ($\bar{x}$=1.19 mm, SD=0.01, n=4). Relative dimensions: HW 100, HL 82–83, UID 64–65, LID 46–48, AOD 16–17, IAD 16–17, OAD 27–28, IOD 18–19, OOD 20–21, CL 19–20, GW 16–17, EW 31–32, ML 36–38, SL 30–31, FL 110–113.

Structure. Head broad, inner orbits converging below, eyes appear bulbous in frontal and side views, eyes with a moderate cover of minute setae, clypeus weakly convex, entirely black, dull with coarse reticulate pattern, appears impunctate, supraclypeal area weakly projected, with a dull sheen, impunctate. Antennae moderately long (FL 1.7 × UID), AS4:AS2+3=0.6. Remainder similar to female except median frontal carina not reaching median ocellus, dorsolateral angles barely projected, mesoscutum openly to closely punctate except densely punctate along midline, punctures distinct, scutellum with a dull sheen, openly punctate mesially, dorsal sculpture of propodeum weak, striolate with a few interconnectives mesially, on basal half only, dorsal rim gently slopes to vertical, colour similar to female; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, lower paraocular areas with some adpressed, plumose hair, almost forming a mat, frons with short, erect, branched hair, mesoventral area almost glabrous, with sparse, short, adpressed hair, weak metasomal tomentum present laterally on T2 and T3; sternal vestiture sparse though forming distinctive pattern, S2 mesial posterior margin and mesially across S3 surface with short, erect, plumose hair, S2 hair posteriorly directed, S3 hair mesially directed forming small, erect tuft at midpoint, S4–S6 with sparse, short, adpressed, simple hair.

Genitalia and associated sterna (figs 76E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli long, dorsoventrally flanged, with short, simple setae except several apical setae thickened and several elongate curved setae mesially, retrorse lobes narrow, elongated, finely setose, ventral flanges absent; S8 median process elongated to narrow parallel sides process, with a few simple setae at apex, S7 median process rounded, glabrous.

Distribution (fig. 76D). Southeastern Queensland.

Etymology. The epithet *demicapillum* means "half hair" and refers to the hair structure in the mesoventral area.

Floral Forage Record. Family visited=1. Catch total=4; Campanulaceae (4 catches). Genus visited; *Wahlenbergia* (4).

Flight Phenology.

1	0	0	1	0	0	0	0	0	3	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Females of *L. demicapillum* are similar to those of *L. humei*, the labrum of these species and of *L. obscurissimum* being almost identical. All three species forage mainly on *Wahlenbergia*, and females have unusual hair structures on their mesoventral area (see figs 25C, 25D).

Lasioglossum (Chilalictus) disclusum (Cockerell)

Figures 77A–E

Halictus disclusus Cockerell, 1914d: 243–244.

Halictus boweni Cockerell, 1915b: 103. syn. nov.

Lasioglossum (*Chilalictus*) *disclusum* — Michener, 1965: 176.

Lasioglossum (*Chilalictus*) *boweni* — Michener, 1965: 175.

Material examined. Holotype of *disclusus*. ♂, Tasmania, Eaglehawk Neck (43°01′S, 147°55′E), 12 Feb–3 Mar 1913, R.E. Turner. 1913-212, BM Type Hym 17.a.979 (BMNH, genital capsule extruded but not dislodged.)

Holotype of *boweni*. ♂, Tasmania, Eaglehawk Neck (43°01′S, 147°55′E), 12 Feb–3 Mar 1913, R.E. Turner. 1913-212, BM Type Hym 17.a.931 (BMNH, genital capsule, last tergite and sternite removed and glued on a card.)

Other specimens examined (23♂♂). Victoria: Mt Evelyn, Emerald.

Tasmania: Eaglehawk Neck, Melaleuca.

Diagnosis. Unlike male of any other species of *L. (Chilalictus)*. Male with body black, antennae long (FL 2.79 × UID), AS4:AS2+3=1, frons reticulate, mesoscutum dull, openly punctate mesially, closely punctate in parapsidal areas, parapsidal lines distinctly raised along entire length, dorsal surface of propodeum not defined by carina, BP absent, sterna with sparse lateral hair tufts on S2–S5.

Description of male (female unknown). Body length 6.31–7.47 mm ($\bar{x}$=6.91 mm, SD=0.31, n=10), head width 1.77–1.93 mm (n= 10), forewing length 1.72–2.00 mm ($\bar{x}$=1.84 mm, SD= 0.08, n= 10). Relative dimensions: HW 100, HL 93–96, UID 62–63, LID 40–42, AOD 13–IAD 13–15, OAD 28–29, IOD 19–21, OOD 16, CL 24–26, GW 20–21, EW 29–32, ML 33–34, SL 22–24, FL 170–173.

Structure. Head almost as long as wide; inner orbits converging below; median frontal carina weakly developed, not reaching median ocellus; eyes with sparse, minute setae. Scape not reaching median ocellus. Clypeus moderately long (CL 0.57 × LID), projecting distinctly below lower margins of eyes, impunctate, shining on basal half, remainder dull with transverse lineolations, supraclypeal area impunctate, microtessellate. Antennae long (FL 2.79 × UID), AS4:AS2+3=1. Frons reticulate above antennal bases, weakly so laterally, sculpture extends beyond lateral ocelli, vertex indistinctly roughened; genae striate. Pronotum dorsolateral process rounded, well projected. Mesoscutum dull, covered with microtessellation, indistinctly punctured, openly punctate mesially, closely to densely punctate laterad of parapsidal lines, closely punctate in parapsidal areas, parapsidal lines distinctly raised along entire length. Scutellum longer than dorsal surface of propodeum, surface dull, densely punctate. Dorsal surface of propodeum not defined by carina, posterovertical carinae not reaching half way to dorsal level, dorsal sculpture widely striolate, weakly rugulose mesially, sculpture not reaching rim. T1 shining, impunctate. Mesepisternum coarsely tessellate, metepisternum similar except a few horizontal striae on upper half. BP absent.

Colour. Body black except mandibles red-brown, clypeus dull yellow on basal half, two metasoma and leg colour combinations were observed as- metasoma black-dark brown, legs brown; metasoma with light red-brown markings on T2 and T3 and apical margin of T1, legs brown except fore and mid tibiae and all tarsi with light red-brown markings.

Vestiture. Body sparse, face with some adpressed hair on lower paraocular areas, remainder and mesoscutum with erect, branched hair, mesoventral area with erect, branched hair, sterna with sparse simple hair forming weak lateral hair tufts on S2–S5.

Genitalia and associated sterna (figs 77B–E). Gonobase reduced, sides narrowed basally, gonocoxite without setae, dorsal surface striate, retrorse lobes setose with long, thick setae, ventral flange well developed, gonostyli long, with long hair on dorsal surface only, a few thickened setae apically; S8 median process weakly projected, rounded apically, almost glabrous, S7 median process rounded, glabrous.

Distribution (fig. 77A). Tasmania and a few records from near Melbourne.

Floral Forage Record. Families visited=2. Catch total=2: Goodeniaceae (1 catch), Myrtaceae (1). Genera visited=2; *Leptospermum* (1), *Scaevola* (1)

Remarks. See *Remarks* for *L. blighi*. Conspecificity of colour variant males was confirmed by examination of genitalia.

Lasioglossum (Chilalictus) ebeneum sp. nov.

Figures 11C, 15F, 78A–H

Material examined. Holotype. ♀, Northern Territory. Illungnarra WH, 90 km SSW of Urandangi (22°18′S, 137°52′E), 15 Oct 1978, JCC, on flowers *Santalum lanceolatum* R.Br. (ANIC).

Paratypes (72♀♀, 72♂♂). Northern Territory: 3♂♂, 9 km E of Tennant Creek (19°39′S, 134°28′E), 10 Nov 1974, EME & T. Low, on *Eucalyptus odontocarpa* (UQIC); 2♂♂ same locality, date and collector, on *Eucalyptus gammophylla* (UQIC); 1♂, Barrow Creek (21°31′S, 133°53′E), 8–9 Nov 1974, EME & R.I. Storey, on *Eucalyptus camaldulensis* (UQIC); 1♀, 5♂♂, 25 km S of Barrow Creek (22°16′S, 133°53′E), 7 Nov 1975, EME & R.I. Storey, on *Eucalyptus normantonensis* (UQIC); 2♀♀, 14♂♂, same data as holotype (ANIC); 4♀♀, Plenty Highway, 268 km ENE of Alice Springs (22°47′S, 136°18′E), 14 Oct 1978, JCC, on flowers *Cassia pleurocarpa* F. Muell. (ANIC); 1♀, 28 km N of Alice Springs (22°52′S, 133°52′E), 5 Nov 1975, EME & R.I. Storey, on *Acacia aneura* (UQIC); 1♀, 12 km N of Alice Springs (23°21′S, 133°52′E), 5 Nov 1975, EME & R.I. Storey, on *Atalaya hemiglauca* (UQIC); 1♂, Todd River, 8 km N of Alice Springs (23°26′S, 133°52′E), 5 Nov 1974, G. Griffin, on *Eucalyptus camaldulensis* (ANIC); 1♂, Mt Solitaire, 30 km WNW of Alice Springs (23°32′S, 133°38′E), 29 Sep 1978, JCC (ANIC); 1♂, Alice Springs (23°42′S, 133°52′E), 21–27 Sep 1972, H. Evans & R.W. Matthews (SAM); 17♀♀, 1♂, 4 km W of Alice Springs (23°42′S, 133°45′E), 31 Oct 1974, EME & R.I. Storey, on *Atalaya hemiglauca* (UQIC); 2♀♀, 2♂♂, 22 km W of Alice Springs (23°42′S, 133°12′E), 2 Dec 1974, EME & R.I. Storey, on *Melaleuca bracteata* (UQIC); 5♀♀, 1♂, Emily Gap, 9 km ESE of Alice Springs (23°45′S, 133°57′E), 19 May 1978, JCC, on flowers *Samolus alerandi* L. (ANIC); 2♂♂, A.R.Z.I., 8 km S of Alice Springs (23°58′S, 133°52′E), 4 Nov 1976, EME & R.I. Storey, on *Eucalyptus gammophylla* (UQIC); 1♀, Waterhouse Range, 39km SSW of Alice Springs, 11 Oct 1978, JCC (ANIC); 1♂ (24°15′S, 133°26′E), James Ranges, 22 Sep 1978, JCC (ANIC).

Western Australia: 5♀♀, 4♂♂, Millstream (21°35′S, 117°04′E), 24–26 Oct 1970, JCC, on *Eucalyptus* (ANIC); 2♀♀, Coppin Pool area, 30 km S of Mt Bruce (22°53′S, 118°08′E), 10–13 May 1980, TFH et al., on *Cassia pruinosa* (WAM: 87/122, 87/123); 1♂, 6 km N of Winning HS (23°06′S, 114°33′E), 30 Mar 1971, E.F. Riek (ANIC); 1♀, 2 km SE of Newman (23°22′S, 119°44′E), 21 Dec 1975, EME & R.I. Storey, on blue flowered bush (UQIC); 3♀♀, 70 mi S Onslow (23°44′S,

115°07′E), 23 Aug 1971, TFH, on *Cassia* (SAM); 2♀♀, same locality, date and collector, on *Ptilotus* (SAM); 1♀, 17m N Carnarvon (23°53′S, 113°40′E), 24 Aug 1975, R.P. McMillan (WAM; 87/459); 17♂♂, 10 km E of Carnarvon (24°53′S, 113°58′E), 3 Jan 1976, EME & R.J. Storey, on *Eucalyptus* (UQIC); 1♀, Carnarvon (24°53′S, 113°40′E), 22 Apr 1955, A. Snell (NMV T-15563); 1♀, 6 km N of Giles, Rawlinson Ranges (25°00′S, 128°18′E), 17 May 1983, G.A. Holloway (AM); 3♂♂, 7 km S of Carnarvon (25°07′S, 113°40′E), 2 Jan 1976, EME & R.J. Storey, on *Eucalyptus* (UQIC); 1♂, 8 km S of Carnarvon (25°09′S, 113°40′E), 4 Jan 1976, EME & R.J. Storey, on *Eucalyptus* (UQIC); 1♀, 16 km N of Meekatharra (26°03′S, 118°30′E), 9 Apr 1971, E.F. Riek (ANIC); 1♀, Irrunytju Rockhole, Hinckley Range (26°07′S, 128°58′E), 19–21 Jan 1990, TFH & M.S. Harvey, on *Eucalyptus microtheca* (WAM 90/334); 1♂, Kalgoorlie (30°45′S, 121°28′E), 30 Nov 1960, P. Aitken (SAM); 4♂♂, Pearce (31°40′S, 116°01′E), A. Douglas (WAM; 52/698, 52/701, 702, 52/724, 725); 1♀, Helena Valley (31°55′S, 116°02′E), 23 Jul 1985, R. Peakall, No. 1385, on flowers of *Prasophyllum fimbria* (WAM; 90/153); 1♀, Gooseberry Hill Nat. Pk, 19 km E of Perth (31°57′S, 116°03′E), 7 Nov 1987, TFH, on *Ptilotus* (WAM; 90/92); 2♂♂, Darlington (Perth) (31°57′S, 115°51′E), May 1975, Mar 1978, G.H. Lowe (WAM; 90/33, 37); 2♀♀, Kalamunda (31°58′S, 116°03′E), 9–28 Feb 1914, R.E. Turner, 1914-258 (BMNH); 1♀, foothills Kelmscott (32°08′S, 116°00′E), 21 Oct 1988, J. Baldwin, jarrah scrub (SAM); 3♀♀, Byford (32°13′S, 116°00′E), 6 Nov 1947, A.B (NMV T-15556–15558); 1♀, 17 km WNW of Balladonia RH (32°17′S, 123°28′E), 18 Sep 1981, IDN & JCC (ANIC); 5♀♀, 37 km SSW of Norseman (32°30′S, 121°37′E), 19 Sep 1981, IDN & JCC (ANIC); 3♀♀, 26 km SE of Pinjarra (32°44′S, 115°58′E), 15 Nov 1989, KLW, on *Xanthorrhoea* (NMV T-15559–15561); 1♀, Coolup (32°45′S, 115°52′E), 2 Dec 1947, C.F. Jenkins (WDA); 2♂♂, Salmon Gums (32°59′S, 121°39′E) (WAM, 41-115, 41-117); 1♀, Bunbury (33°20′S, 115°38′E), 10–22 Dec 1958, A. Snell (AM); 1♀, Collie (33°22′S, 116°09′E), 14 Feb 1957, A. Snell (NMV T-15562); 2♂♂, S.W. Corner, Jan 1958, A. Snell (ANIC); 1♂, no locality (WAM 87/782).

Other specimens examined (152♀♀, 92♂♂). Queensland: Weengallon, Eulo, Cunnamulla, St George, Roma, Banana, Edungalba, Longreach, Middleton, Mt Isa, Herberton.

New South Wales and Australian Capital Territory: Gilgandra, Nyngan, Cobar, Mootwingee Nat. Pk, Coonabarabran, Narrabri.

South Australia: Adelaide, Port Wakefield, Arthurton, Kulpara, Mt Illbilles, Cowell, Whyalla, Port Germein, Whyalla, Port Pirie, Orroroo, Nonning HS, Quorn, Wilpena, Hawker, Pimba, Dingly Dell Camp, Trezona Camp, Brachina Gorge, Parachilna, Moolawatana, Roxby Downs, Flinders Range, Everard Ranges.

Diagnosis. Most like *L. chapmani*. Both sexes with body black. Female with frons coarsely reticulate, mesoscutum punctation moderately coarse, interspaces shining except dull along anterior margin, remainder densely punctate, dorsal surface of propodeum ruguloso-striolate, defined by angular posterolateral carinae forming deeply recessed pockets. Male with antennae moderately long, posterolateral propodeal carinae more angular than in female, frons, paraocular areas and supraclypeal area with dense short adpressed hair forming a mat, S2–S4 with long plumose posteriorly directed hair in rows across sterna; S8 median process elongate, broadly bilobed and truncate apically; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.54–8.16 mm ($\bar{x}$=7.48 mm, SD=0.50, n=10), head width 2.14–2.30 mm (n=10), forewing length 1.83–2.00 mm ($\bar{x}$=1.90 mm, SD=0.05, n=10). Relative dimensions: HW 100, HL 80–82, UID 60–61, LID 50–53, AOD 18–20, IAD 12–14, OAD 25–26, IOD 17–19, OOD 15–16, CL 20–21, GW 17–18, EW 24–25, SL 37–38, FL 65–68.

Structure. Head broad with distinct triangular shape, inner orbits converging below, median frontal carina reaches median ocellus, eyes appear bare, with a few minute setae. Scape reaching anterior margin of lateral ocelli. Clypeus short (CL 0.37 × LID) weakly convex, surface shining except along anterior margin, closely to densely punctate with rounded punctures, supraclypeal area weakly projected, densely punctate around margins. Frons (fig. 78A) coarsely reticulate above antennal bases, sculpture laterally weakens, extends vertically to posterior margin of lateral ocelli. Labrum (fig. 78B) basal median area raised, weakly verruculose, anterior margin almost straight, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges weak and serrate almost extend to margin, distal margin setose, lateral teeth large, distally hooked. Pronotum dorsolateral angles acute, well projected. Mesoscutum (fig. 78C) anterior margin rounded, punctation moderately coarse, interspaces shining except dull along anterior margin, remainder densely punctate. Scutellum 1.09 × longer than dorsal surface of propodeum, weakly concave mesially, surface shining, openly to closely punctate. Dorsal surface of propodeum (fig. 11C) defined by angular posterolateral carinae set well below dorsal level, carinae form deeply recessed pockets, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate mesially, striolate laterally, sculpture reaches dorsal rim, T1 densely punctate, small mesolateral areas openly punctate, surface shin-

ing (fig. 15F). Mesepisternum an metepisternum coarsely striate. BP bluntly rounded.

Colour. Body shining black, mandible red-brown apically, antennal flagellum underneath brown.

Vestiture. Body sparse, frons and paraocular areas with erect plumose hair, mesoscutum with similar shorter hair, metanotum with short, dense, adpressed, tomentose hair, T2 and T3 with lateral tomentum, T3 tomentum almost meets, T4 with a broad band of tomentum across tergite.

Description of male. Body length 5.78–6.54 mm ($\bar{x}$=6.24 mm, SD=0.26, n=10), head width 1.79–2.02 mm (n=10), forewing length 1.50–1.72 mm ($\bar{x}$=1.62 mm, SD=0.06, n=10). Relative dimensions: HW 100, HL 86–88, UID 62–63, LID 47–48, AOD 15–16, IAD 14–15, OAD 25–26, IOD 19–20, OOD 16–17, CL 21–22, GW 13–14, EW 30–31, ML 34–36, SL 24–25, FL 123–125.

Structure. Head broad with eyes appearing large, inner orbits converging below, eyes with few minutes setae, scape not reaching median ocellus, clypeus basally concave, shining, indistinctly openly punctate, anterior three-quarters pale yellow, supraclypeal area weakly projected, shining. Antennae moderately long (FL 2.02 × UID), AS4:AS2+3=1. Remainder of body similar to female except mesoscutum mesially openly to densely punctate, posterolateral propodeal carinae more angular than in female dorsal sculpture coarsely ruguloso-striate across entire surface; T1 openly to closely punctate; colour similar to female except legs bright orange-red except males from southern and NSW legs brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Frons, paraocular areas and supraclypeal area with dense short adpressed hair forming a mat, anterior margin of clypeus with some similar hair, metanotal hair not tomentose, T2–T4 with strong lateral tomentum; S2–S4 with long plumose posteriorly directed hair in rows across sterna, S5 with short sparse simple setae.

Genitalia and associated sterna (figs 78E–H). Gonobase slightly narrowed basally, gonocoxite with setae on apical inner margin and lateral setae, gonostyli long with long branched hair on upper surface, retrorse lobes well developed, setose, ventral flanges present, penis valves enlarged dorsoposteriorly; S8 median process elongate, broadly bilobed and truncate apically with a few simple setae, S7 median process rounded.

Distribution (fig. 78D). Eyrean province, though also recorded from southern New South Wales, Victoria or across northern Australia and from the high rainfall areas of southwestern Western Australia.

Seven macrocephalic males were recorded from Western Australia (Pearce and Perth only). Four specimens (2♀♀, 2♂♂) carried large numbers of hypopial nymphal mites. In both sexes the attachment areas are the underturned genae and the basal portion of T1.

Etymology. The epithet *ebeneum* means "ebony" and refers to the shining black colour of species.

Floral Forage Record. Families visited=15. Catch total=71; Amaranthaceae (2 catches), Dilleniaceae (1), Fabaceae (7), Liliaceae (1), Loranthaceae (1), Malvaceae (1), Myoporaceae (6), Myrtaceae (32), Orchidaceae (2), Primulaceae (1), Proteaceae (4), Santalaceae (1), Sapindaceae (9), Xanthorrhoeaceae (1), Zygophyllaceae (2). Genera visited=18; *Acacia* (4), *Amyema* (1), *Asphodelus* (1), *Atalaya* (9), *Cassia* (3), *Diuris* Sm. (1), *Eremophila* (6), *Eucalyptus* (29), *Hakea* (4), *Hibbertia* (1), *Melaleuca* (3), *Nitraria* (2), *Prasophyllum* (1), *Ptilotus* (2), *Samolus* (1), *Santalum* (1), *Sida* L. (1), *Xanthorrhoea* (1).

Flight Phenology.

6	3	3	2	6	0	2	4	7	27	33	16
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. This strikingly beautiful species displays a number of anomalous characters. *Lasioglossum ebeneum* distribution is unusual in that it occurs in both the high rainfall region of south west Western Australia and the dry Eyrean province. Absence from the mallee region of northwestern Victoria may be a collecting artefact.

The male dorsal propodeal carinae and sculpture are more strongly defined and more coarse than in the female, the opposite of the general pattern. The leg colour of males from the desert areas of the Eyrean province is bright orange-red, while those from the periphery of this arid region, such as in southern Queensland, New South Wales and southern South Australia, have brown legs. Maslin and Hopper (1982) noted that the desert peripheral area is a zone of high speciation which they termed "the desert peripheral pattern". *Lasioglossum ebeneum* may be in the process of speciation in this zone and

specimens from these peripheral localities are not included in the paratype series. Examination of genitalia revealed no discernible differences between the colour morphs.

Lasioglossum (Chilalictus) edentulatum sp. nov.

Figures 79A–D

Material examined. Holotype. ♀, Queensland, 62 km NW of Charters Towers (19°48′S, 146°02′E), 20 Nov 1988, KLW, on *Eucalyptus* (NMV T-15564).

Paratypes. 2♀♀, same data as holotype (one specimen gold coated) (NMV T-15565–15566).

Diagnosis. Most like *L. nefrens*. Female with body black, frons striate, vertex and genae broadened, mandibular preapical teeth absent, mesoscutum shining, anterior margin with weakly bilobed mesial projection, punctation moderately coarse, dorsal surface of propodeum ruguloso-striolate, defined by angular posterolateral carinae. fore tibial spur fan shaped.

Description of female (male unknown). Body length 5.70–6.74 mm ($\bar{x}$=5.97 mm, SD=0.38, n=2), head width 1.69–1.76 mm (n=2), forewing length 1.48–1.55 mm ($\bar{x}$=1.52 mm, SD=0.05, n=2). Relative dimensions: HW 100, HL 82–85, UID 60–61, LID 55–56, AOD 19–20, IAD 11–12, OAD 26–27, IOD 18–20, OOD 14–15, CL 20–21, GW 19–23, EW 25–27, SL 38–39, FL 71–72.

Structure. Head broad, inner orbits converging slightly below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaching at least anterior margin of lateral ocelli. Clypeus short (CL 0.38 × LID), convex basally, surface shining except dull along anterior margin, anteriorly closely punctate with deeply impressed punctures, indistinctly punctate along posterior margin with small rounded punctures, supraclypeal area weakly projected, shining, openly punctate mesially, densely punctate around margins. Frons (fig. 79A) striate above antennal bases, sculpture laterally weakens, extends vertically to level of anterior margin of lateral ocelli. Vertex narrow behind ocelli, broadened behind upper levels of eyes. Genae in side view broadened under upper level of eye. Labrum (fig. 79B) basal median area slightly raised, weakly nodulated, anterior margin rounded mesially, distal process short, not widest at base, slightly flanged distally, median keel spatulate, extends to distal margin, lateral ridges weak, dorsally smooth, extend to setose distal margin, lateral teeth small, not hooked. Preapical teeth of mandibles absent. Pronotum dorsolateral angles of pronotum acute, well projected. Mesoscutum (fig. 79C) anterior margin with weakly bilobed mesial projection, punctation moderatcly coarse, surface shining except anteriorly with transverse lines and dull, along midline, posterior margin and posterior half of parapsidal areas densely punctate, mesially sparsely to openly punctate. Scutellum 1.2 × longer than dorsal surface of propodeum, surface shining, almost impunctate except few punctures along midline and around margins. Dorsal surface of propodeum (fig. 79C) well defined by posterolateral carinae set just below dorsal level, posterolateral carinae angular, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate mesially, striolate laterally, sculpture just extends to dorsal rim mesially, dorsal rim rounded, dull. T1 densely punctate. Mesepisternum striate, metepisternum smooth. Fore tibial spur fan shaped; BP rounded.

Colour. Body black except antennae above and metasoma brown, antennae underneath and legs light red-brown.

Vestiture. Frons with short simple branched hair, lower paraocular areas with short adpressed plumose hair, clypeus and supraclypeal area almost glabrous, few simple setae, mesoscutum with sparse cover of erect branched hair, weak tomentum along posterior margin, weak tomentum along anterior margin of metanotum, tomentum lateral on T2 and T3, across on T4.

Distribution (fig. 79D). Central Queensland.

Etymology. The epithet *edentulatum* means "without a tooth" and refers to the lack of a pre-apical tooth on the mandible.

Floral Forage Record. Family visited and Catch total=1; Myrtaceae (1 catch). Genus visited, *Eucalyptus* (1).

Flight Phenology.

0	0	0	0	0	0	0	0	0	0	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The description of this species highlights the unusual character state of the mandible without a pre-apical tooth. *Lasioglossum edentulatum* is the sister taxon of *L. nefrens*, which also lacks a pre-apical tooth on the mandible. Both species occur in Queensland and are allopatric.

Lasioglossum (Chilalictus) eremaean sp. nov.

Figures 4B, 16C, 80A–H

Material examined. Holotype, ♀, Northern Territory, 30 km S of Alice Springs (24°12′S, 133°52′E), 1 Nov 1974, EME & R.I. Storey, on *Calandrinia balonensis* and *Helichrysum bracteatum* (QM T13855).

Paratypes (64♀♀, 12♂♂). Northern Territory: 2♀♀, 22 km W of Alice Springs (23°42′S, 133°12′E), 2 Nov 1974, EME & R.I. Storey, on *Melaleuca bracteata* (UQIC); 4♀♀, 8 km S of Alice Springs (23°58′S, 133°52′E), 30 Oct 1974, EME & R.I. Storey, on *Wahlenbergia* (UQIC); 3♀♀, 30 km S of Alice Springs (24°12′S, 133°52′E), 3 Nov 1974, EME & R.I. Storey, on *Eucalyptus gammophylla* (UQIC); 56♀♀, 12♂♂, same data as holotype (QM T13855).

Other specimens examined (437♀♀, 299♂♂). Queensland: Eulo, Windorah.

New South Wales: Wentworth, Broken Hill, Menindee Lakes, Quandong, Wilcannia, Mootwingee Nat. Pk, Fowlers Gap Res. Stn, White Cliffs, Lake Starvation, Tibooburra.

Victoria: Wilkur, Kerang.

South Australia: West Beach, Monarto, Marino, Adelaide, Victor Harbour, Hamilton, Purni Bore, Pooginook, Androssan, Wild Horse Plains, Port Wakefield, Cowell, Eyre Pen., Port Pirie, Whyalla, Port Germein, Port Pirie, Whyalla, Orroroo, Nonning HS, Quorn, Ceduna, West Franklin Island, Ceduna, Milang, Penong, Oakden Hills Stn, Hawker, Lake Torrens, Martins Well, Curnamona HS, Pimba, Wirraminna HS, Wilpena, Parachilna, Woomera, Roxby Downs, Lake Frome, Ooldea, Immarna, Tarcoola, Flinders Ranges, Maree, Monte Collina Bore, Coward Springs, William Ck, Etadunna HS, Emu, Everard Pk HS, Coongie Lakes, Clifton Hills, Abminga, Amata (Musgrave Park) Northern Territory: Alice Springs, Mt Cavenagh, Kunoth.

Western Australia: Cannington, Yundamindra, Mt Magnet, Wiluna, Mt Nossiter, Lake Cohen.

Diagnosis. Most like *L. metallicum*. Both sexes head and propodeum black, mesoscutum metallic green/blue, metasoma black suffused with brown. Female with frons punctate, mouthparts with glossa moderately long, and hirsute, mesoscutum densely punctate, dorsal surface of propodeum ruguloso-striolate, not defined by carina, BP apically pointed, T1 with mesolateral hair bands, metasomal tomentum across T2–T4. Male with antennae moderately long (FL 2.34 × UID), AS4 equal to AS2 + 3, glossa moderately long and hirsute, T1 with mesolateral hair tufts, sternal vestiture sparse, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.16–7.62 mm ($\bar{x}$ = 6.86 mm, SD = 0.41, n = 10), head width 1.97–2.16 mm (n = 10), forewing length 1.64–1.90 mm ($\bar{x}$ = 1.81 mm, SD = 0.09, n = 10). Relative dimensions: HW 100; HL 86–88; UID 58–59; LID 53–55; AOD 20–21, IAD 09–10, OAD 28–29, IOD 18–19, OOD 14–15, CL 21–22, GW 15–17, EW 23–24, SL 38–39, FL 65–66.

Structure. Head distinctly triangular (fig. 4B), inner orbits converging below, median frontal carina reaches about half way to median ocellus, eyes with conspicuous moderate cover of short setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.38 × LID), large portion protruded below lower level of eyes, in side view clypeus appears to protrude well over mandible bases, surface weakly convex, more so basally, polished, openly punctate with small, rounded punctures, supraclypeal area slightly projected, shining, mesially impunctate, around margins closely punctate. Frons (fig. 80A) closely punctate above antennal bases, punctures not forming wavy striae, sculpture laterally weakens to almost smooth along inner orbits, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 80B) basal process large, median area conspicuously raised, smooth except for a few weak ridges anteriorly, anterior margin rounded mesially, distal process small, not widest at base, weakly flanged distally, median keel weakly spatulate, extends to distal margin, lateral ridges absent, distal margin setose, lateral teeth small, not hooked. Mouthparts with glossa moderately long, and hirsute. Pronotum dorsolateral angles bluntly obtuse, well projected. Mesoscutum (fig. 80C) anterior margin with rounded mesial projection, surface shining, punctation conspicuously coarse, anteriorly dull and impunctate, remainder densely punctate, small interspaces present across entire surface. Scutellum 1.24 × longer than dorsal surface of propodeum, shining, openly to closely punctate mesially, densely punctate around margins. Dorsal surface of propodeum (fig. 80C) not defined by carina, posterovertical carinae not extending half way to dorsal level, dorsal sculpture coarsely ruguloso-striolate across entire surface, sculpture dorsal rim. T1 densely punctate. Mesepisternum and metepisternum striate on upper half, remainder smooth. BP narrow, apically pointed.

Colour. Head and propodeum black, mesoscutum metallic coppery green-blue colour, metasoma black to dark brown except terga posterior marginal areas light brown, mandibles amber except apically red-brown, antennal flagellum light brown underneath, legs brown.

Vestiture. Body moderately hirsute, paraocular areas with short, adpressed and erect branched setae forming a weak mat, frons with a

few long, erect hairs, clypeus with a few minutely branched hair, mesoscutum with sparse cover of short, erect, branched hair, except small hair tufts along posterior margin, anterior margin of axillae and metanotum with tomentous hair, T1 with mesolateral hair bands (fig. 16C), metasomal tomentum across T2–T4.

Description of male. Body length 4.77–6.24 mm ($\bar{x}$=5.69 mm, SD=0.52, n=10), head width 1.55–1.83 mm (n=10), forewing length 1.32–1.67 mm ($\bar{x}$=1.54 mm, SD=0.12, n=10). Relative dimensions: HW 100, HL 90–92, UID 63–64, LID 45–47, AOD 16–17, IAD 14–15, OAD 27–28, IOD 21–22, OOD 18–19, CL 22–23, GW 17–18, EW 24–25, ML 36–38, SL 25–26, FL 145–150.

Structure. Head elongate, triangular, inner orbits converging below, sparsely covered with minute setae, scape not reaching median ocellus, clypeus convex, polished, sparsely to openly punctate with small, rounded punctures, basal half pale yellow, supraclypeal area shining, with a few punctures, glossa moderately long and hirsute. Antennae moderately long (FL 2.34 × UID), AS4:AS2+3=1. Remainder of body similar to female except mesoseutal punctation dense along midline, closely to densely punctate mesially, dorsal surface of propodeum weakly striolate laterally, dorsal rim smooth and shining; colour similar to female with mesoscutum metallic blue-green; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body vestiture moderate, paraocular areas and lower, lateral frons with short, adpressed, plumose hair forming a weak mat, genae with conspicuous cover of hair, mesoscutum with weak hair tuft along posterior margin, T1 mesolateral hair tufts well developed, metasomal tomentum present across T2–T4; sternal vestiture sparse, S2–S4 with erect, long, branched hair, S5 with some similar hair laterally, S6 almost glabrous.

Genitalia and associated sterna (figs 80E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli long, with sparse simple or weakly branched setae, retrorse lobes setose, weakly developed, ventral flanges absent; S8 median process broadly rounded apically, glabrous, S7 rounded, glabrous.

Distribution (fig. 80D). Eyrean province but not north of the equal summer/winter rainfall line (*sensu* Nix, 1982).

Etymology. The epithet *eremaean* refers to the distribution pattern of this species.

Floral Forage Record. Families visited=25. Catch total=108; Aizoaceae (5 catches), Amaranthaceae (2), Boraginaceae (1), Campanulaceae (2), Chenopodiaceae (2), Compositae (12), Convolvulaceae (1), Crueiferae (3), Dierastylidaceae (1), Fabaceae (6), Frankeniaccae (3), Goodeniaceae (2), Hydrocotylaceae (1), Labiatae (1), Liliaceae (2), Malvaceae (1), Myoporaceae (16), Myrtaceae (14), Oxalidiaceae (1), Portulaeaceae (5), Proteaceae (10), Sapindaceae (2), Serophulariaceae (6), Solanaceae (3), Zygophyllaceae (6). Genera visited=43; *Acacia* (4), *Anthocercis* Labill. (1), *Asphodelus* (2), *Atalaya* (1), *Atriplex* L. (1), *Blennodia* R.Br. (1), *Cakile* (2), *Calandrinia* (5), *Carpobrotus* (3), *Cassia* (1), *Chrysanthemum* (1), *Convolvulus* (1), *Craspedia* (2), *Dicrastylis* (1), *Dodonaea* Mill. (1), *Eremophila* (16), *Eucalyptus* (11), *Frankenia* (3), *Goodenia* (2), *Grevillea* (2), *Hakea* (8), *Helichrysum* (1), *Helipterum* (2), *Hibiscus* (1), *Melaleuca* (3), *Mesembryanthemum* (2), *Myriocephalus* (2), *Nicotiana* (1), *Nitraria* (3), *Oxalis* (1), *Ptilotus* (2), *Rutidosis* (1), *Salsola* (1), *Senecio* (2), *Solanum* (1), *Stemodia* (6), *Swainsona* (1), *Taraxacum* (1), *Trachymene* (1), *Tribulus* (3), *Trichodesma* R.Br. (1), *Wahlenbergia* (2), *Westringia* Sm. (1).

Flight Phenology.

3	4	2	1	2	0	5	5	26	51	41	7
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. This species is commonly collected throughout the arid and semi-arid areas of Australia. To minimise variation within the paratype series, only those specimens taken at the same time, in the areas surrounding the type locality, were chosen. (See *Remarks* on *L. metallicum* for discussion of metallic mesosomal colour).

Lasioglossum (Chilalictus) eremophilum sp. nov.

Figures 81A–D

Material examined. Holotype. ♀, South Australia, 18 km S of Quorn (32°30′S, 138°02′E), 25 Oct 1990, KLW, on *Eremophila* (NMV T-15567).

Paratypes 2♀♀. Western Australia, 6 km E of Yellowdine (31°18′S, 119°44′E), 10 Oct 1981, IDN & JCC, on flowers of *Eremophila*, ex ethanol (ANIC).

Diagnosis. Head and glossa development unlike any other species. Female with body black, head elongate, length equal to width, frons 0.32 × HW, vertex enlarged, particularly behind upper margins of eyes, head quadrate apically; proboscis and head variously elongated, measure-

ments compared to HW (mean (SD), n=3): GL 0.59 (0.01); LPL 0.35 (0.01); MPL 0.75 (0.02); PML 0.80 (0.01), HL 1.00 (0.01); glossa densely hirsute; mesoscutal punctation distinctly double-punctate, openly to closely punctate, dorsal surface of propodeum ruguloso-striolate, not defined by carinae.

Description of female (male unknown). Body length 6.01–6.16 mm ($\bar{x}$=6.06 mm, SD=0.09, n=3), head width 1.53–1.57 mm (n=3), forewing length 1.48–1.53 mm ($\bar{x}$=1.50 mm, SD=0.03, n=3). Relative dimensions: HW 100, HL 99–101, UID 65–66, LID 54–56, AOD 19–20, IAD 12, OAD 32–33, IOD 25–26, OOD 14–16, CL 22–23, GW 22–23, EW 27–28, SL 38–39, FL 61–62.

Structure. Head elongate, as long as broad; inner orbits converging slightly below; median frontal carina extends to median ocellus, well developed basally, weak apically; eyes sparsely covered with erect, stout setae; vertex broadened laterally behind upper levels of eyes, head quadrate shape apically. Scape reaching median ocellus. Clypeus produced downward, not protuberant forward, in side view, clypeus almost flat, produced so that two-thirds lies below lower ends of eyes; supraclypeal area not noticeably produced, in side view, weakly protuberant; clypeus curved laterally, smooth and shining, dorsally dull, finely lineate, closely punctured, punctures separated by diameter of puncture, punctures near ventral margin large, elliptical, punctures near epistomal suture small, rounded; supraclypeal area dull, indistinctly punctured; proboscis variously elongated, comparison to HW (mean (SD), n=3); GL 0.59 (0.01), LPL 0.35 (0.01), MPL 0.75 (0.02), PML 0.80 (0.01), maxillary and labial palpi not structurally modified; glossa densely hirsute. Frons elongate 0.32 × HW, costulate above antennal bases, laterally weakens to almost smooth along inner margins of eyes, extends vertically to posterior margin of lateral ocelli, paraocular areas smooth to finely reticulate. Labrum (fig. 81B) basal area raised, surface coarsely roughened with numerous raised, distinctly separated, nodules, anterior margin bluntly obtuse mesially, distal process flanged, not widest at base, median keel well developed, extending slightly beyond distal margin, lateral keels absent, distal margin setose, few strong lateral teeth present, distally hooked. Pronotum dorsolateral angles weakly projected, rounded. Mesoscutum (fig. 81C) anterior margin with weakly bilobed mesial projection, punctation fine, surface dull covered with fine reticulate pattern, anteriorly impunctate, mesially between parapsidal lines distinctly double-size punctate, along midline densely punctate with small punctures, mesially openly to closely punctate, sparsely interspersed with large puncture about twice diameter of small punctures, parapsidal areas indistinctly marked with minute punctures. Scutellum length 1.4 × greater than dorsal surface of propodeum length, surface dull, sculpture similar to mesoscutum, sparse and irregularly punctured. Dorsal surface of propodeum (fig. 81C) not defined by carinae, posterovertical carinae present, extending three-quarters of distance to dorsal surface, dorsal surface dull, surface alveolate, surface weakly ruguloso-striolate mesially to weakly striolate laterally, sculpture not reaching dorsal rim, mesiad sculpture not reaching posterior rim. T1 densely punctured, punctures minute. Mesepisternum and metepisternum striate. BP rounded; forewings with first recurrent vein interstitial with first cubital vein (holotype) or enters base of third submarginal cell (paratypes).

Colour. Body black, flagellar segments dark brown above, light brown below; tarsi, posterior margin of metasomal terga light brown.

Vestiture. Body sparse, head with few erect, minutely branched hairs on frons and paraocular areas, vertex with a few long hairs between lateral ocelli, mesoscutum with erect, minutely branched hairs, sparse mesially, more dense laterally, weak tomentous hair present on laterally on T2–T4.

Distribution (fig. 81D). Eyrean province in southern Western Australia and South Australia.

Etymology. The epithet *eremophilum* refers to the presumed food plant of the species.

Floral Forage Record. Family visited=1. Catch total=2; Myoporaceae (2 catches). Genus visited, *Eremophila* (2).

Flight Phenology.

0	0	0	0	0	0	0	0	0	2	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Lasioglossum (Chilalictus) erythrurum (Cockerell)

Figures 82A–H

Halictus erythrurus Cockerell, 1914a: 504–505.

Halictus cyclognathus Cockerell, 1914a: 511, syn. nov.

Halictus rufotinctus Cockerell, 1915a: 7–8, syn. nov.

Halictus forticornis Cockerell, 1916b: 372, syn. nov.

Halictus erythrurus atrocyaneus Cockerell, 1918a: 117, syn. nov.
Halictus basilucens Cockerell, 1923: 239, syn. nov.
Halictus erythrurus mainusculus Rayment, 1930a: 53, syn. nov.
Halictus suberythrurus Rayment, 1935: 691, syn. nov.
Lasioglossum (Chilalictus) erythrurum. — Michener, 1965: 176.
Lasioglossum (Chilalictus) cyclognathum. — Michener, 1965: 176.
Lasioglossum (Chilalictus) rufotinctum. — Michener, 1965: 177.
Lasioglossum (Chilalictus) forticorne. — Michener, 1965: 176.
Lasioglossum (Chilalictus) atrocyaneum. — Michener, 1965: 175.
Lasioglossum (Chilalictus) basilucens. — Michener, 1965: 175.
Lasioglossum (Chilalictus) mainusculum. — Michener, 1965: 176.
Lasioglossum (Chilalictus) suberythrurum. — Michener, 1965: 177.

Material examined. Syntypes of *erythrurus*: 1♀, Victoria, Croydon (37°48′S, 145°17′E), 177, Pres. by S.W. Fulton, 14 Jan 1909, USNM Type No. 58170 (USNM, has been repinned as hole present in the left side of the scutellum); 1♀, Victoria, Croydon (37°48′S, 145°17′E), 182, Pres. by S.W. Fulton, 14 Jan 1909, T-10463 (NMV, missing antennae, head has been glued to body).

Holotype of *cyclognathus*, ♂, Victoria, Croydon (37°48′S, 145°17′E), Pres. by S.W. Fulton, 14 Jan 1909, 200 (ANIC, macrocephalic development.)

Holotype of *rufotinctus*, ♀, Queensland, Brisbane (27°28′S, 153°02′E), 3 Oct 1912, H. Hacker, HY4120 (QM, glued to card with second specimen marked "var a". Note that 3♀♀ specimens with similar label data, lodged in USNM, are not considered to be part of the type series as the original description refers only to the specimen lodged in the QM.)

Holotype of *forticornis*, ♂, Western Australia, Kalamundra (31°58′S, 116°03′E), 9–28 Feb 1914, R.E. Turner, 1914-258, BM Type Hym 17.a.940 (USNM, missing fore tibia and tarsi, left antennae glued to card. Note that 1♀ specimen with similar label data, lodged in USNM, is not considered to be part of the type series as the original description refers only to the specimen lodged in the QM.)

Holotype of *atrocyaneus*, ♀, Queensland, Brisbane (27°28′S, 153°02′E), 8 Feb 1916, H. Hacker, USNM Type No. 58168 (USNM).

Holotype of *basilucens*, ♀, Queensland, Bribie Island (27°03′S, 153°08′E), 29 Aug 1918, H. Hacker (QM).

Holotype of *mainusculus*, ♀, Western Australia, Perth (31°57′S, 115°51′E), 19 Oct 1929, T. Greaves (ANIC, head glued to mesosoma, right hind leg glued to pith; missing right fore leg, left fore tibia and tarsi.)

Holotype of *suberythrurus*, ♀, Victoria, Balmoral (37°15′S, 141°50′E), 3 Feb 1929, V. James (ANIC, glued to card, mandibles opened to display labrum).

Other specimens examined (1130♀♀, 41♂♂.) Queensland: Wallangarra, Wyberba Nat. Pk, Stanthorpe, Ballandean, Eukey, Glen Aplin, Liston, Amiens, Goondiwindi, Inglewood, Warwick, Leyburn, Thargomindah, Cunnamulla, St George, Tamborine, Ipswich, Wacol, Stradbroke Is, Brisbane, Murphys Creek, Mt Nebo, Beerwah, Miles, Caloundra, Landsborough, Chinchilla, Quilpie, Dulacca, Windorah, Mungallala, Noosa, Morven, Charleville, Thylungra, Tewah Ck, Eidsvold, Emerald, Atherton, Gordonvale.

New South Wales and Australian Capital Territory: Nadgee Reserve, Batemans Bay, Honeysuckle Creek, Upper Cotter, Blundells, Milton, Canberra, Bungendore, Yass, Bowning, Bargo, West Wylong, Mt Tomah, Kurrajong, Clarence, Broken Hill, Narromine, Mendooran, Wilcannia, Gilgandra, Nyngan, Cobar, Coonabarabran, Fowlers Gap Res. Stn, Tamworth, Uralla, Hillgrove, Armidale, Narrabri, Mt Kaputar Nat. Pk, Bourke, Llangothlin, Tenterfield, Wallangarra, Lennox Head, Woodenbong.

Victoria: Lorne, Portland, Cobboboonee State Forest, Melbourne, Cann River, Dunkeld, Genoa, Mt Macedon, Broadford, Omeo, Stawell, St. Arnaud, Euroa, Mitre, Horsham, Glenrowan, Warracknabeal, Donald, Wilkur, Birchip, Kerang, Murrayville, Hattah.

Tasmania: Frodshams Pass, Queenstown, Strahan, Pieman Bridge, Scottsdale.

South Australia: Rendelsham, Robe, Reedy Creek, Rendelsham, Kongal, Salt Creek, Flinders Chase Nat. Pk, Kangaroo Island, Keith, Meningie, Finniss, Mt Compass, Hartley, Yorke Penin., Mt Lofty, Waterfall Gully, Adelaide, Tusmore, Athelstone, Purnong, Billiatt Nat. Pk, Port Lincoln, Renmark, Port Germein, Kyancutta, Kimba, Terowie, Lake Gilles, Oodla Wirra, Minnipa, Orroroo, Poochera, Wilmington, Tandaie Rockholes, Wirrulla, Penong, Ceduna, Nullarbor, Brachina Gorge, Lake Hart, Immarna, Mt Serle.

Northern Territory: Angas Downs, Alice Springs, Corroboree Rock, Alice Springs, Barrow Creek.

Western Australia: Margaret River, Kojonup, Katanning, Shoal Cape, Glencoe, Ravensthorpe, Mt Ragged, Ravensthorpe, Grass Patch, Waroona, Lake King, Dwellingup, Salmon Gums, Hatter Hill, Kumarl Siding, Toolinna Rockhole, Pinjarra, Norseman, Norseman, Pingelly, Lake Cronin, Balladonia RH, Cocklebiddy, Perth, Madura, Mundaring, Higginsville, Eucla, Meckering, Perth, Merredin, Yellowdine, Coolgardie, Southern Cross, Boorabbin Rock, Dedari, Comet Vale Siding, Menzies, Dongara, Youanmi, Neale Junction, Carnarvon, Gascoyne Junction, Carnarvon, Newman, Mt Bruce, Whim Creek.

Diagnosis. Most like *L. mundulum*. Female with head and propodeum black, mesoscutum dull metallic green-blue with copper tinge, metasoma red-brown except T1 with black on anterior two thirds, frons striate, mesoscutum anterior margin rounded, shining, closely to densely punctate, dorsal surface of propodeum

ruguloso-striolate, defined by posterolateral carinae, fore tibial spur fan shaped. Male with body black, antennae long (FL 2.0 × UID), AS4: AS2+3=1, lower frons and paraocular areas with dense cover of hair forming a mat, S2–S4 with sparse cover of posteriorly directed, plumose hair, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.00–5.08 mm ($\bar{x}$=4.50 mm, SD=0.36, n=10), head width 1.32–1.53 mm (n=10), forewing length 1.06–1.34 mm ($\bar{x}$=1.18 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 80–81, UID 61–62, LID 59–60, AOD 20–22, IAD 10–11, OAD 31–32, IOD 20–21, OOD 14–15, CL 18–19, GW 18–19, EW 24–25, SL 36–38, FL 64–66.

Structure. Head triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.32 × LID), convex, more so along basal margin and laterally, surface smooth and shining except posterior margin dull covered with fine reticulate pattern, closely punctate mesially with deeply impressed punctures, laterally sparsely punctate with slightly smaller punctures, posterior margin openly punctate with small, rounded, shallow punctures, supraclypeal area raised, with a dull sheen, sparsely punctate with small, shallow punctures. Frons (fig. 82A) striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 82B) median basal area raised forming V-shaped tubercle, anterior margin rounded, margin raised forming lip, distal process triangular, widest at base, median keel distally spatulate, extends well beyond margin, lateral ridges large and broad, dorsally smooth, basally recurved towards median keel, setae not present across distal margin, lateral teeth small, straight. Pronotum dorsolateral angles rounded, well projected. Mesoscutum (fig. 82C) anterior margin rounded, punctation moderately coarse, surface shining, anteriorly impunctate, remainder closely to densely punctate. Scutellum length equal to length of dorsal surface of propodeum, surface shining except dull along midline and around margins, closely punctate anteriorly and along posterior margin, remainder sparsely punctate. Dorsal surface of propodeum (fig. 82C) defined by posterolateral angular carinae set well below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate with a few striae laterally, sculpture almost reaches dorsal rim mesially, not laterally, dorsal rim with a dull sheen, gently rounded. T1 densely punctate except posterior marginal area impunctate. Mesepisternum lower half shining though with a fine reticulate pattern, upper half striate, metepisternum dull, striate. Fore tibial spur fan shaped; BP rounded.

Colour. Head and propodeum black, mesoscutum dull metallic green-blue with copper tinge, metasoma red-brown except T1 with black on anterior two-thirds, legs black, fore tibiae suffused with brown.

Vestiture. Frons with sparse erect, minutely branched hair, paraocular areas with similar adpressed hair, mesoscutum almost glabrous, with a few erect, branched hairs, metasomal tomentum absent.

Description of male. Body length 3.39–4.00 mm ($\bar{x}$=3.70 mm, SD=0.21, n=10), head width 1.03–1.15 mm (n=10), forewing length 0.80–0.94 mm ($\bar{x}$=0.86 mm, SD=0.05, n=10). Relative dimensions: HW 100, HL 80–82, UID 64–66, LID 44–45, AOD 12–13, IAD 15–16, OAD 27–28, IOD 27–28, OOD 14–15, CL 18–19, GW 16–17, EW 32–33, ML 36–38, SL 24–26, FL 130–132.

Structure. Head triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute hair, clypeus weakly convex, surface smooth and shining, almost impunctate though with several minute punctures mesially, basal half dull white/yellow, supraclypeal area smooth and shining. Antennae moderately long (FL 2.0 × UID), AS4:AS2+3=1. Remainder as in female except frons striate, pronotum dorsolateral angles rounded, weakly projected, mesoscutum anterior margin rounded, surface smooth and shining, sparsely to openly punctate with minute punctures, scutellum smooth, polished, impunctate, dorsal surface of propodeum not defined by carinae, sculpture weakly ruguloso-striolate, extending about half way to dorsal rim, rim smooth and shining; colour of body black, mandibles and clypeus as noted dull white yellow, antennal flagellum light red-brown underneath, legs dark brown with fore, and mid tibiae and all tarsi light red-brown, hind tibiae suffused with light red-brown; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower frons and paraocular areas with dense cover of hair forming a mat, clypeus with some long hairs, mesoscutum almost glabrous, metasomal tomentum absent; S2–S4

with sparse cover of posteriorly directed, plumose hair across sternites.

Genitalia and associated sterna (figs 82E–H). Gonobase sides weakly flanged basally, gonocoxite without setae, gonostyli long, with sparse short hair distally, retrorse lobes weakly setose, well developed, ventral flanges present; S8 median process rounded and setose apically; S8 apically rounded and setose, S7 median process similar except glabrous.

Distribution (fig. 82D). Southern half of Australia, partially in the Eyrean and extensively throughout the Bassian provinces.

Floral Forage Record. Families visited=22. Catch total=252; Aizoaceae (2 catches), Anacardiaceae (1), Campanulaceae (2), Compositae (1), Dicrastylidaceae (1), Dilleniaceae (1), Epacridaceae (2), Fabaceae (21), Goodeniaceae (1), Labiatae (2), Liliaceae (1), Loranthaceae (5), Myoporaceae (10), Myrtaceae (176), Pittosporaceae (8), Proteaceae (6), Rutaceae (1), Santalaceae (2), Sapindaceae (4), Solanaceae (2), Sterculiaceae (1), Xanthorrhoeaceae (2). Genera visited=42; unidentified genus of Compositae (1), *Acacia* (9), *Amyema* (5), *Angophora* (7), *Anthocercis* (1), *Aotus* Sm. (1), *Atalaya* (3), *Baeckea* (2), *Boronia* (1), *Brachychiton* (1), *Bursaria* (6), *Calytrix* (4), *Carpobrotus* (1), *Crotalaria* (1), *Daviesia* (2), *Dichopogon* Kunth. (1), *Dicrastylis* (1), *Disphyma* N.E. Brown (1), *Eremophila* (9), *Eucalyptus* (126), *Eucarya* (1), *Goodenia* (1), *Grevillea* (6), *Heterodendrum* (1), *Hibbertia* (1), *Jacksonia* (4), *Leptospermum* (7), *Leucopogon* (2), *Melalenca* (27), *Myoporum* (1), *Pittosporum* Banks & Solander apud Gaertn. (2), *Prostanthera* (1), *Pultenaea* (4), *Santalum* (1), *Schinus* (1), *Solanum* (1), *Syzygium* Gaertn. (1), *Thryptomene* (1), *Tristaniopsis* (1), *Wahlenbergia* (2), *Westringia* (1), *Xanthorrhoea* (2).

Flight Phenology.

58	37	21	6	9	0	0	7	34	70	86	42
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. See *Remarks* on *L. hemichalceum*. *Lasioglossum erythrurum* and *L. hemichalceum* and are part of the so called "*erythrurum*" species complex (*sensu* Houston, 1970). I do not believe that morphological characters alone can resolve the subtle complexities of this species-complex and that electrophoretic or DNA analysis is required. The nominal species *L. erythrurum* may itself be a complex of at least three species. These "forms" differ only on the degree of mesoscutal punctation; on form "a" the mesoscutum is densely punctate with the punctures contiguous, on form "b" the mesoscutum is openly punctate, while on form "c" (which includes the syntypes of *erythrurum*) the mesoscutum is closely to densely punctate with interspaces present between punctures. Forms "a" and "b" occur only in the lower Eyrean province.

Lasioglossum (Chilalictus) eurycephalum sp. nov.

Figures 4C, 83A–H

Material examined. Holotype. ♀, Northern Territory, 4 km W of Alice Springs (23°42′S, 133°45′E), 31 Oct 1974, EME & R.I. Storey, on *Acacia aneura* (QM T13856).

Paratypes (19♀♀, 12♂♂). Northern Territory: 17♀♀, same data as holotype (UQIC); 1♀, 7 km NW of Alice Springs (23°36′S, 133°58′E), 8 Nov 1979, IDN, on *Eucalyptus* (ANIC); 12♂♂, 25 km S of Barrow Creek (22°16′S, 133°53′E), 7 Nov 1974, EME & R.I. Storey, on *Eucalyptus normantonensis* (UQIC); 1♀, Ti-Tree (22°08′S, 133°16′E), 7 Nov 1974, EME & R.I. Storey, on *Eucalyptus camaldulensis* (UQIC).

Other specimens examined (27♀♀, 2♂♂). Queensland: Thargomindah, Noccundra, Quilpie, Windorah, Morven, Charleville, Thylungra.

New South Wales: Mootwingee.

Western Australia: Leonora, Youanmi, Neale Junction, Belele, Rawlinson Ranges, Giles.

Diagnosis. Like *L. ebeneum* but head shape different. Both sexes with body black; head laterally broadened, ovoid shape. Female with frons short (OAD 0.21 × HW), coarsely reticulate, reticulation forms irregular lines to appear somewhat striate, clypeus and supraclypeal area contours almost confluent with contours on frons and paraocular areas, mesoscutum shining, punctation moderately coarse, dorsal surface of propodeum defined by angular posterolateral carinae, sculpture ruguloso-striolate. Male with antennae moderately long, AS4:AS2+3=1.15, clypeus black, dorsal surface of propodeum posterolateral carinae well developed and angular, S2–S4 with long posteriorly directed plumose hair in dense rows across sternites, S5 with sparse short adpressed simple hair; S8 median process elongate, apically truncate and bilobed.

Description of female. Body length 6.54–7.32 mm ($\bar{x}$=6.95 mm, SD=0.27, n=10), head width 2.07–2.26 mm (n=10), forewing length 1.76–1.95 mm ($\bar{x}$=1.84 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 72–75, UID

61–63, LID 53–56, AOD 20–21, IAD 12–14, OAD 21–22, IOD 20–22, OOD 16–17, CL 18–20, GW 14–15, EW 24–25, SL 38–39, FL 80–81.

Structure. Head laterally broadened (fig. 4C) distinct ovoid shape, inner orbits weakly converging below, median frontal carina well developed, reaches median ocellus, eyes appear bare, few sparse minute setae; ocelli widely separated. Scape reaches anterior margin of lateral ocelli. Clypeus short (CL 0.38 × LID), flat, clypeus and supraclypeal area contours almost confluent with contours on frons and paraocular areas, surface dull, coarsely punctured with large deeply impressed punctures, surface entirely densely punctate, supraclypeal area with interspaces shining, close to densely punctate. Frons (fig. 83A) short (OAD 0.21 × HW), coarsely reticulate, reticulation forms irregular lines to appear somewhat striate, sculpture weaker laterally, sculpture at reaches anterior margin of lateral ocelli. Labrum (fig. 83B) basal median area slightly raised, surface smooth, anterior margin gently rounded, distal process not tapered, widest at base, medial keel extends to distal margin, lateral ridges weak, barely reach margin, setae not present across distal margin, lateral teeth large, weakly hooked distally Pronotum dorsolateral angles acute, well projected. Mesoscutum (fig. 83C) anterior margin rounded, surface with interspaces shining mesially, punctation moderately coarse, anteromesially with fine lineolation, anterolaterally weakly striate, densely punctate mesially with interspaces present, parapsidal areas punctures contiguous. Scutellum 1.1 × longer than dorsal surface of propodeum, surface shining, open to closely punctate. Dorsal surface of propodeum (fig. 83C) defined by angular posterolateral carinae set well below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture closely ruguloso-striolate, sculpture reaches rim and continues onto vertical surface. T1 shining, densely punctate. Mesepisternum and metepisternum striate. BP broadly rounded apically; forewings with 1st m-cu (first recurrent) institutial with 1st r-m or entering base of third submarginal cell.

Colour. Body black except mandibles red-brown apically, antennal flagellum underneath, legs and apical margin of tergites brown.

Vestiture. Body with moderate cover, frons and paraocular areas with erect branched hair, clypeus and supraclypeal area with simple and branched hair, mesoscutum with sparse cover of erect branched hair, tomentum laterally on T2 and T3, broad band of tomentum across T4; S2 and S3 with erect long plumose hair across sternites.

Description of male. Body length 4.77–6.16 mm ($\bar{x}$ = 5.26 mm, SD = 0.42, n = 10), head width 1.67–1.88 mm (n = 10), forewing length 1.29–1.53 mm ($\bar{x}$ = 1.40 mm, SD = 0.08, n = 10). Relative dimensions: HW 100, HL 70–75, UID 61–63, LID 46–48, AOD 15–17, IAD 16–17, OAD 22–23, IOD 21–22, OOD 15–16, CL 16–18, GW 12–14, EW 29–30; ML 37–38, SL 25–28, FL 133–136.

Structure. Head distinctly broad, eyes converging below, few minute setae; clypeus closely punctate and dull, entirely black; ocelli widely separated; scape not reaching median ocellus. Antennae moderately long (FL 2.16 × UID), AS4: AS2+3 = 1.15. Remainder similar to female but with pronotal dorsolaterally rounded, mesoscutum openly punctate mesially, densely punctate in parapsidal areas with interspaces present, dorsal surface of propodeum posterolateral carinae well developed and angular, dorsal sculpture openly ruguloso-striolate; colour similar except antennae and legs light brown, metasoma brown; forewings with 1st m-cu (first recurrent) institutial with 1st r-m, 2nd r-m as strong as 1st r-m.

Vestiture. Frons, paraocular areas, clypeus and supraclypeal area densely covered with short adpressed plumose hair forming a mat, mesoscutum with erect branched hair, weak lateral tomentum on T2 and T3; S2–S4 with long posteriorly directed plumose hair in dense rows across sternites, S5 with sparse short adpressed simple hair.

Genitalia and associated sterna (figs 83E–H). Gonobase slightly narrowed basally, gonocoxite without setae, gonostyli long with branched hair, penis valves flanged basally, retrorse lobes setose, well developed, ventral flanges absent; S8 median process elongate, apically truncate and bilobed, with a few simple setae, S7 median process rounded.

Distribution (fig. 83D). Central Australia.

Etymology. The epithet *eurycephalum* refers to the large breadth of the head capsule.

Floral Forage Record. Families visited = 5. Catch total = 12; Campanulaceae (1 catch), Fabaceae (4), Myoporaceae (2), Myrtaceae (4), Solanaceae (1). Genera visited = 5; *Acacia* (4), *Eremophila* (2), *Eucalyptus* (4), *Solanum* (1), *Wahlenbergia* (1).

Flight Phenology.

0	0	1	0	2	0	0	1	12	3	3	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum eurycephalum is one of the few black, non-metallic black species that occurs exclusively within the Eyrean province. Males of *L. eurycephalum* have unusual strongly defined propodeal carinae and coarse sculpture. The head length (HL 72–75) and frons length (OAD 21–22) of the female are some of the shortest known within the subgenus.

Lasioglossum (Chilalictus) expansifrons (Cockerell)

Figures 16B, 26A, 84A–H

Halictus expansifrons Cockerell, 1914a: 521.
Lasioglossum (*Chilalictus*) *expansifrons*. — Michener, 1965: 176.

Material examined. Syntypes. 2♂♂, New South Wales, Nat. Mus. Victoria, 102, BM Type Hym 17.a.946 (BMNH, both syntypes are glued to triangular cards attached to the same pin. One card has type written on the base. The other syntype has lost its head.)

Other specimens examined (98♀♀, 65♂♂). Queensland: Roma.

New South Wales and Australian Capital Territory: Conargo, Canberra, Gilgandra, Wilcannia, Cobar, Coonabarabran, Gunnedah, Mt Kaputar, Bellata, Boggabilla.

Victoria: Moe, Pakenham, Mordialloc, Kewell, Warracknabeal, Wilkur, Gunbower, Lake Albacutya, Kerang, Mildura.

South Australia: Adelaide, Athelstone, Wilmington.

Diagnosis. Most like *L. chapmani*. Both sexes with body black. Female with frons reticulate-striate, mesoscutum surface shining, densely punctate, dorsal surface of propodeum weakly ruguloso-striolate, weakly defined posterolaterally by carinae. Male with antennae moderately long, frons, paraocular areas and supraclypeal area with dense hair forming a mat, S4 with two median tufts of long plumose hair, tufts weakly separated along midline, hair posterolaterally directed; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.16–6.93 mm ($\bar{x}$=6.61 mm, SD=0.25, n=10), head width 1.97–2.12 mm (n=10), forewing length 1.60–1.86 mm ($\bar{x}$=1.71 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 78–79, UID 61–62, LID 53–56, AOD 20–21, IAD 11–12, OAD 23–25, IOD 19–20, OOD 15–16, CL 19–21, GW 19–20, EW 23–25, SL 38–40, FL 65–68.

Structure. Head broad and triangular, inner orbits converging below, median frontal carinae reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.38 × LID), convex, surface shining, open to closely punctate, supraclypeal area weakly projected, shining, sparsely punctate. Frons (fig. 84A) reticulate-striate above antennal bases, pattern, sculpture weaker laterally, sculpture extends to anterior margin of lateral ocelli. Labrum (fig. 84B) basal median area raised, surface weakly nodulated, anterior margin rounded, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges weak, distinctly serrate, not reaching distal margin, setae not present across distal margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles acute, weakly projected. Mesoscutum (fig. 84C) anterior margin rounded, surface shining, anterior margin dull with fine lineolation, punctation moderately coarse, surface entirely densely punctate. Scutellum 1.3 × longer than dorsal surface of propodeum, surface shining, closely to densely punctate. Dorsal surface of propodeum (fig. 84C) weakly defined posterolaterally by carinae set well below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal sculpture weakly ruguloso-striolate, extends to rim mesially only. T1 densely punctate except small impunctate areas laterally (fig. 16B). Mesepisternum and metepisternum striate. BP rounded.

Colour. Body black; antennae, legs and anterior margin of tergites brown.

Vestiture. Body sparse, paraocular area with adpressed and erect branched hair, clypeus and supraclypeal area almost glabrous, frons with erect simple hair, mesoscutum with short erect branched hair, tomentum laterally on T2, across terga on T3 and T4.

Description of male. Body length 5.16–6.01 mm ($\bar{x}$=5.56 mm, SD=0.27, n=10), head width 1.69–1.81 mm (n=10), forewing length 1.36–1.57 mm ($\bar{x}$=1.44 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 87–88, UID 63–64, LID 48–49, AOD 16–17, IAD 11–13, OAD 23–25, IOD 19–20, OOD 17–19, CL 20–21, GW 19–20, EW 25–27; ML 37–38, SL 28–29, FL 120–123.

Structure. Head triangular, inner orbits converging below, eyes with sparse minute setae, scape not reaching median ocellus, clypeus and supraclypeal area shining, indistinctly punctate, clypeus yellow on basal half to three-quarters. Antennae moderately long (FL 1.92 × UID), AS4:AS2+3=1. Remainder of body similar to

female except mesoscutum punctation close mesially, posterolateral propodeum carinae absent, dorsal rim smooth and rounded, metasoma brown, tarsi and tibiae apically and basally light yellow-brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Frons, paraocular areas and supraclypeal area with dense short adpressed hair forming a mat, anterior margin of clypeus with some similar hair, T2 and T3 with weak lateral tomentum; S2 with long plumose hair mesially, hair not reaching lateral margins of sternite, S3 with similar reaches lateral margins, S4 with two median tufts of long plumose hair, tufts weakly separated along midline, hair posterolaterally directed (fig. 28A).

Genitalia and associated sterna (figs 84E–H). Gonobase slightly flanged basally, gonocoxite setose on apical inner margin and lateral setae, retrorse lobes setose, well developed, ventral flanges present, penis valves flanged basally, gonostyli with short simple and weakly branched hair; S8 median process apically broad, truncate and bilobed, with a few setae, S7 median process rounded, glabrous.

Distribution (fig. 84D). Eastern zone (except Tasmania) of the Bassian province.

Floral Forage Record. Familics visited=4. Catch total=16; Compositae (1 catch), Myrtaceae (7), Pittosporaceae (1), Sapindaccae (7). Genera visited=6; *Atalaya* (7), *Baeckea* (1), *Bursaria* (1), *Eucalyptus* (5), *Helichrysum* (1), *Melaleuca* (1).

Flight Phenology.

3	3	2	2	0	0	0	1	2	2	6	9
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. See *Remarks* for *L. chapmani*. Five macrocephalic males, two showing gross enlargement of the head capsule, were recorded (Cobar, NSW (1); Kerang, Vic (3); Wilmington, SA (1)). The measurements of these specimens are: body length 5.78–6.70 mm ($\bar{x}$=6.33 mm, SD=0.40), head width 1.93–2.35 mm, forewing length 1.48–1.64 mm ($\bar{x}$=1.56 mm, SD=0.07). Relative dimensions: HW 100, HL 78–82, UID 65–67, LID 58–64, AOD 18–20, IAD 16–17, OAD 22–24, IOD 19–20, OOD 17–19, CL 18–19, GW 21–26, EW 23–26; ML 41–46, SL 23–27, FL 105–112.

Lasioglossum (Chilalictus) falcatum sp. nov.

Figures 85A–D

Material examined. Holotype. ♀, Queensland, 35 mi (56 km) W of Quilpie (26°37′S, 144°02′E), 16 Apr 1969, TFH, on *Abutilon* (QM T13857).

Paratypes. 7♀♀, same data as holotype (UQIC).

Diagnosis. Most like *L. lamellosum*. Female with body black, frons striate, clypeus and supraclypeal area produced forward, not continuing contours of frons and paraocular areas, both surfaces polished, mesoscutum densely punctate, dorsal surface of propodeum rugulosostriolate, weakly defined by posterolateral carinae set well below dorsal level, outer hind tibial spur recurved distally.

Description of female (male unknown). Body length 7.55–8.47 mm ($\bar{x}$=8.12 mm, SD=0.29, n=7), head width 2.23–2.31 mm (n=7), forewing length 2.00–2.16 mm ($\bar{x}$=2.06 mm, SD=0.06, n=7). Relative dimensions: HW 100, HL 82–85, UID 60–62, LID 53–55, AOD 20–21, IAD 12–13, OAD 24–25, IOD 19–20, OOD 15–16, CL 20–22, GW 15–16, EW 24–26, SL 39–40, FL 69–71.

Structure. Head broad, distinctly triangular, inner orbits converging below, median frontal carina not reaching median ocellus, eyes with sparse cover of minute setae. Scape reaching at least anterior margin of lateral ocelli. Clypeus and supraclypeal area distinctly produced forward, not continuing contours of frons and paraocular areas, both surfaces polished, clypeus short (CL 0.4 × LID), convex, more so basally, densely punctate anteriorly with deeply impressed, rounded punctures, remainder open to closely punctate with shallow, smaller punctures, supraclypeal area closely punctate. Frons (fig. 85A) above antennal bases weakly striate, laterally sculpture weakens to almost smooth along inner margins of eyes, sculpture continues to anterior margin of lateral ocelli. Labrum (fig. 85B) basal median area raised, variously ridged and nodulated, lateral areas weakly recessed, anterior margin obtuse mesially, distal process not tapered, widest at base, median keel extends to setose distal margin, lateral ridges weak and smooth, extend to distal margin, lateral teeth large, not hooked. Pronotum dorsolaterally rounded, barely projected. Mesoscutum (fig. 85C) anterior margin rounded, punctation moderately coarse, anteriorly impunctate, with fine transverse lines, remainder with small punctures densely punctate, along midline and in parapsidal areas punctures contiguous, mesially small shining interspaces present. Scutellum 1.3 × longer than dorsal surface of propodeum, surface shining, densely punctate along midline and around margins, remainder open to closely

punctate. Dorsal surface of propodeum (fig. 85C) weakly defined by posterolateral carinae set well below dorsal level, posterovertical carinae extend at least half-way to dorsal carinae, dorsal sculpture ruguloso-striolate mesially, striolate laterally, sculpture not reaching dorsal rim, posterior surface dull with fine reticulate pattern. T1 densely punctate. Mesepisternum and metepisternum striate. BP rounded; outer hind tibial spur recurved distally (cf. Fig. 18F).

Colour. Body black; clypeus, supraclypeal area, antennae, metasoma and legs brown, some specimens with basal half of propodeum tinged brown.

Vestiture. Body sparse, frons and paraocular areas with long branched hair, clypeus and supraclypeal area almost glabrous, with few simple setae, mesoscutum with sparse cover of short erect branched setae, tomentum laterally on T2, across tergites on T3 and T4.

Distribution (fig. 85D). South-west Queensland.

Etymology. The epithet *falcatum* refers to the sickle-shape of the outer hind tibial spur.

Floral Forage Record. Family visited=1. Catch total=1; Malvaceae (1 catch). Genus visited, *Abutilon* Mill. (1).

Flight Phenology.

0	0	0	1	0	0	0	0	0	0	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The recurved outer hind tibial spur is a synapomorphy shared with *L. lamellosum.* Parsimony analysis (paper in prep.) placed *L. falcatum* within a species-group characterised by several synapomorphies, one of which is the possession of mid coxal processes on the male. I suggest such processes are present on the as yet unknown male of *L. falcatum.*

Lasioglossum (Chilalictus) fasciatum sp. nov.

Figures 22A, 28B, 86A–H

Material examined. Holotype, ♀, Western Australia, 14 km NW of Kalgoorlie (30°42′S, 121°25′E), 2 Feb 1973, EME, on *Salsola kali* (QM T13906).

Paratypes (58♀♀, 54♂♂). Same data as holotype (UQIC).

Other specimens examined (265♀♀, 159♂♂). South Australia: West Beach, Shea Oak Log, Wallaroo, Whyalla, Kyancutta, Port Germein, Lake Gilles Nat. Pk, Port Augusta, Ceduna, Hawker, Pimba, Lake Hart, Woomera, Lake Ifould, Ooldea, William Creek, Lake Meramangye.

Western Australia: Gnowangerup, Ravensthorpe, Dumbleyung, Salmon Gums, Lake King, Norseman, Hyden, Madura, York, Euela, Merredin, Kellerberrin, Meekering, Baandee, Yellowdine, Nukarni, Nungarin, Coolgardie, Koolyanobbing, Broad Arrow, Mt Linden, Warriedar HS, Geraldton, Yuinmery HS, Newman, Onslow.

Diagnosis. Like *L. veronicae* but with different metasomal colour banding. Both sexes with head and mesosoma metallic green, metasoma with each tergite banded dark green anteriorly, light red-brown posteriorly. Female with frons striate, mesoscutum polished, anteromesially openly to closely punctate, posteromesially close to densely punctate, in parapsidal areas openly punctate, scutellum highly polished, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae set well below dorsal level, T1 posterior marginal area impunctate, fore tibial spur fan shaped. Male with antennae moderately short (FL 1.50 × UID), AS4:AS2+3=0.63, antennal scapes and underneath of flagellum light yellow, mesoscutum brown with olive green tinge, tegulae and wing veins light yellow, legs yellow, fore coxae with dense hair cover, fore trochanters with several long hairs, S2–S4 with short, semi-erect, plumose hair, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.00–4.54 mm ($\bar{x}$=4.33 mm, SD=0.20, n=10), head width 1.22–1.36 mm (n=10), forewing length 0.96–1.10 mm ($\bar{x}$=1.03 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 79–81, UID 60–61, LID 54–56, AOD 18–19, IAD 14–16, OAD 32–33, IOD 24–25, OOD 12–14, CL 18–20, GW 16–17, EW 27–28, SL 32–34, FL 63–64.

Structure. Head broad, inner orbits slightly converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape not reaching median ocellus. Clypeus short (CL 0.36 × LID), surface convex, anterior margin weakly concave, surface shining to polished, almost impunctate basally, sparsely punctate with a few minute punctures, weak lineolation along posterior margin, openly punctate along margin, supraclypeal area raised mesially, with a dull sheen, impunctate to sparsely punctate with minute punctures. Frons (fig. 86A) above antennal bases striate, laterally sculpture weakens to punctate and smooth along inner orbits, vertically extends to anterior margin of lateral ocelli. Labrum (fig. 86B) median basal area raised mesially forming weak V-shaped tubercles, anterior margin rounded mesially, lip raised laterally, distal process triangular, widest at base, median keel extends to

distal margin, lateral ridges weakly serrate, extends to margin, setae not present across margin, lateral teeth small, distally straight. Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 86C) anterior margin rounded, surface polished, punctation moderately coarse, anteriorly dull and impunctate, anteromesially open to closely punctate, posteromesially close to densely punctate, in parapsidal areas openly punctate. Scutellum length of dorsal surface of propodeum, surface highly polished, impunctate. Dorsal surface of propodeum (fig. 86C) defined by posterolateral carinae set well below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture rugulosostriolate mesially, laterally almost smooth, sculpture almost reaches dorsal rim, rim smooth and polished, curves gently to vertical surface. T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum smooth and shining. Fore tibial spur fan shaped; BP rounded.

Colour. Head and mesosoma metallic green, metasoma dark green and light red-brown banded, mandibles, basal third of clypeus and scape apically amber coloured, mandibles red-brown apically, antennal flagellum light brown underneath, mesoscutum emerald green, tegulae light yellow, metasomal tergites dark green to black on anterior half, at least posterior marginal areas to posterior half light red-brown, legs light red-brown amber.

Vestiture. Body with moderate cover, frons and paraocular areas with short, adpressed, plumose hair cover though not forming mat, pronotum vertical with dense mat of short, adpressed hair, margins of mesoscutum with narrow, band of short, minutely plumose hair, metanotum with dense cover of short, white hair, metasomal tomentum laterally on T2 and T3, hind trochanters and coxae with dense cover of long, plumose hair.

Description of male. Body length 3.16–3.85 mm ($\bar{x}$=3.47 mm, SD=0.24, n=10), head width 1.15–1.32 mm (n=10), forewing length 0.85–0.92 mm ($\bar{x}$=0.87 mm, SD=0.03, n=10). Relative dimensions: HW 100, HL 81–82, UID 64–65, LID 58–60, AOD 15–16, IAD 17–18, OAD 31–32, IOD 26–27, OOD 15–16, CL 18–20, GW 17–19, EW 30–32; ML 43–49, SL 24–26, FL 95–97.

Structure. Head broad, inner orbits weakly converging below, median frontal carina reaches median ocellus, clypeus flat to weakly convex, smooth and polished, basal half light yellow, supraclypeal area flat, shining, impunctate. Antennae moderately short (FL 1.50 × UID), AS4:AS2+3=0.63. Remainder similar to female except mesoscutum polished, sparse to openly punctate mesially with minute punctures, parapsidal areas impunctate, dorsal surface of propodeum not defined by carinae, dorsal sculpture broadly ruguloso-striolate with a few striae laterally, sculpture not reaching rim, rim highly polished; colour similar except, mandibles, clypeus as noted, scapes and underneath of antennal flagellum light yellow, mesoscutum brown with olive green tinge, tegulae and wing veins light yellow, metasoma lightly banded, anteriorly brown, posteriorly light brown, legs yellow; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower frons, paraocular area and genae with dense cover of short, adpressed hair forming a mat, hypostomal area with erect, curved hair, fore coxae with dense hair cover, fore trochanters with several long, minutely branched hairs (fig. 22A), mesoscutum without marginal hair band, metasomal tomentum absent; S2–S4 with cover of short, semi-erect, posteriorly directed, plumose hair, S5 and S6 with sparse short hair (fig. 28B).

Genitalia and associated sterna (figs 86E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli long, with moderate cover of long, branched hair, retrorse lobes glabrous, well developed, ventral flanges present; S8 median process broadly, apically rounded and setose, S7 median process rounded and glabrous.

Distribution (fig. 86D). Southern half of the Eyrean province, also extends partially into the south western region of Western Australia.

Etymology. The epithet *fasciatum* refers to the banded or striped appearance of the dorsal surface of the metasoma.

Floral Forage Record. Families visited=11. Catch total=48; Aizoaceae (2 catches), Anacardiaceae (3), Chenopodiaceae (1), Frankeniaceae (1), Labiatae (1), Myoporaceae (4), Myrtaceae (29), Proteaceae (4), Santalaceae (1), Solanaceae (1), Zygophyllaceae (1). Genera visited=14; *Anthocercis* (1), *Carpobrotus* (1), *Eremophila* (4), *Eucalyptus* (20), *Frankenia* (1), *Grevillea* (1), *Hakea* (3), *Melaleuca* (9), *Mesembryanthemum* (1), *Nitraria* (1), *Salsola* (1), *Santalum* (1), *Schinus* (3), *Westringia* (1).

Flight Phenology.

11	9	2	2	1	0	0	1	4	11	12	3
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Macrocephalic males are present but much less frequently than in *L. florale* and *L. vitripenne*. Gross macrocephalic development, as found in *L. florale*, has not been recorded in *L. fasciatum*. The vestiture of the male fore trochanters is unique to this species.

Lasioglossum (Chilalictus) florale (Smith)

Figures 20A,D, 22B, 28C, 87A-H

Halictus floralis Smith, 1853: 57.
Halictus vividus Smith, 1879: 35. syn. nov.
Lasioglossum (Chilalictus) florale. — Michener, 1965: 176.
Lasioglossum (Chilalictus) vividum. — Michener, 1965: 177.

Material examined. Holotype of *floralis*. ♀, New Holland (Australia), BM Type Hym 17.a.897 (BMNH, missing hind tarsal segments.).

Holotype of *vividus*. ♀, Western Australia, Swan River (31°57′S, 115°51′E), BM Type Hym 17.a.904 (BMNH, missing left antenna, head and forelegs glued to pronotum.)

Other specimens examined (1202♀♀, 796♂♂). South Australia: Swan Reach, Arthurton, Morgan, Cowell, Lock, Whyalla, Kyancutta, Kimba, Port Germein, Lake Gilles Nat. Pk, Poochera, Minnipa, Streaky Bay, Orroroo, Nonning HS, Ceduna, Haslam, Quorn, Smokey Bay, Wirrulla, Penong, Wilpena, Nundroo Nullarbor, Pimba, Andamooka, Roxby Downs, Immarna, Ooldea, Maralinga, Coober Pedy.

Western Australia: Mount Ragged, Ravensthorpe, Salmon Gums, Hatter Hill, Toolinna Rockhole, Norseman, Balladonia, Lake Cronin, Caiguna, Cocklebiddy, Madura, Eucla, Higginsville, Merredin, Burracoppin, Carrabin, Yellowdine, Southern Cross, Coolgardie, Boorabbin Rock, Mt Jackson, Dedari, Mulline, Paynes Find.

Diagnosis. Like *L. greavesi* but with different mesoscutal punctation. Both sexes metallic green. Female with frons elongate, striate, mesoscutum with dull sheen, mesially sparsely to openly punctate, parapsidal areas openly punctate, dorsal surface of propodeum rugulosostriolate, defined by strong posterolateral carinae set well below dorsal level, fore tibial spur fan shaped. Male with antennae moderately long (FL 2.24 × UID), AS4:AS2+3=1, AS2+3, distal three flagellar segments swollen, genal hair long, forming a beard, dense cover of long hair on fore coxae, S3 and S4 with hair forming V-shaped pattern with lateral tufts on S4, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.00–4.93 mm ($\bar{x}$=4.48 mm, SD=0.32, n=10), head width 1.27–1.43 mm (n=10), forewing length 1.06–1.32 mm ($\bar{x}$=1.20 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 84–85, UID 60–61, LID 58–59, AOD 20–21, IAD 10–11, OAD 37–38, IOD 23–24, OOD 12–14, CL 15–16, GW 20–22, EW 24–26, SL 37–38, FL 67–70.

Structure. Head broadly triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaching not reaching median ocellus. Clypeus short (CL 0.27 × LID), weakly convex, surface with a dull sheen, basally with a few openly to closely punctate large, deeply impressed punctures, posteriorly openly punctate with smaller, shallow, rounded punctures, supraclypeal area moderately raised mesially, surface dull, sparsely to openly punctate. Frons (fig. 87A) elongate, above antennal bases coarsely punctate/striate, laterally sculpture weakens to punctate, vertically just extends to anterior margin of lateral ocelli. Labrum (fig. 87B) median basal area forming V-shaped tubercles, anterior margin rounded mesially, forming distinct lip along anterior margin, distal process tapered, widest at base, median keel reaches margin, lateral ridges large, smooth, reaching basal area, setae not across distal margin, lateral teeth small, not hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 87C) anterior margin rounded, surface with a dull sheen, covered with distinct reticulate pattern, punctation moderately fine, anteriorly impunctate, along midline sparsely punctate, mesially sparsely to openly punctate, laterad of parapsidal lines a few punctures open to closely punctate, in parapsidal areas openly punctate. Scutellum 0.9 × shorter than dorsal surface of propodeum, surface shining, almost impunctate, a few punctures along midline. Dorsal surface of propodeum (fig. 87C) defined by strong posterolateral carinae set well below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture coarsely rugulosostriolate mesially almost reaching dorsal rim, laterally with a few striae not reaching rim, rim dull, gently rounded to vertical surface. Metasomal T1 densely punctate except posterior marginal area openly to closely punctate. Mesepisternum smooth and highly polished except striate on upper portion, metepisternum striate. Fore tibial spur fan shaped; BP broadly rounded.

Colour. Body metallic green; mandibles amber with red-brown at apex, antennal flagellum light brown underneath, clypeus black with copper tinge basally, anteriorly with blue/purple tinge, supraclypeal area coppery, mesoscutum

anteriorly with copper tinge, blue tinge posteriorly in parapsidal areas, metasoma with copper tinge, fore and mid tibiae, tarsi and apical one portion of femora light red-brown, remainder black, hind tibiae basal and apical areas and tarsi light red-brown, remainder black.

Vestiture. Body sparse, frons and paraocular areas with some semi-erect, branched hair, mesoscutum with sparse cover of short, erect hair, weak metasomal tomentum laterally on T2 and across T3.

Description of male. Body length 4.16–4.62 mm ($\bar{x}$=4.34 mm, SD=0.14, n=10), head width 1.27–1.39 mm (n= 10), forewing length 1.06–1.15 mm ($\bar{x}$=1.09 mm, SD=0.03, n=10). Relative dimensions: HW 100, HL 76–78, UID 65–66, LID 56–57, AOD 18–19, IAD 11–13, OAD 32–33, IOD 14–16, OOD 15–16, CL 15–16, GW 18–20, EW 31–32; ML 48–52, SL 30–31, FL 144–148.

Structure. Head broad, inner orbits converging weakly below, median frontal carinae well developed, reaches median ocellus. frons coarsely striate, clypeus short, impunctate, basal half bright yellow, remainder black, supraclypeal area flat, impunctate. Antennae moderately long (FL 2.24 × UID), AS4:AS2+3=1 (fig. 20A), distal three flagellar segments swollen (fig. 20D), proximal segments distinctly longer than wide. Remainder similar to female except pronotal dorsolateral angles not projected, mesoscutum mesially sparsely to openly punctate, scutellum polished, impunctate, propodeum posterolateral carinae well developed, mesepisternum polished; body colour with a dull metallic green sheen, clypeus as noted above, mandibles and apical portion of antennal scapes bright yellow, antennal flagellum brown above, dull yellow underneath except distal three segment black, fore and mid femora, tibiae and tarsi yellow-brown except posterior margin of femora dark brown, hind femora dark brown, apical and basal portion of tibiae and tarsi yellow-brown, remainder of tibiae light brown; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Frons with sparse, erect simple hair, lower paraocular areas with adpressed, plumose hair forming a weak mat, genal hair long, minutely plumose forming a beard (fig. 22B), dense cover of long hair on fore coxae, weak lateral metasomal tomentum on T2 and T3; S2 with dense cover of adpressed, minutely branched hair, S3 and S4 with similar hair across sterna though mesial hair shorter and lateral hair forming lateral tufts, more so on S4, S5 and S6 with moderate cover of short, adpressed, minutely branched hair (fig. 28C).

Genitalia and associated sterna (figs 87E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli long, weakly swollen apically, with long, branched hair apically, retrorse lobes glabrous, well developed, ventral flanges present, finely striate; S8 median process elongate, broadly rounded apically, with setae on lateral margin and apex, S7 median process elongate, narrowly rounded apically, glabrous.

Distribution (fig. 87D). Southern Eyrean province corresponding to the "mallee" (*sensu* Carnahan and Deveson, 1990) area, but not recorded from the mallee of northwestern Victoria.

Floral Forage Record. Families visited=10. Catch total=94; Aizoaceae (1 catch), Fabaceae (5), Goodeniaceae (2), Labiatae (1), Loranthaceae (3), Myoporaceae (18), Myrtaceae (50), Proteaceae (6), Sapindaceae (5), Zygophyllaceae (3). Genera visited=15; *Acacia* (5), *Aizoon* L. (1), *Amyema* (3), *Atalaya* (5), *Eremophila* (15), *Eucalyptus* (36), *Grevillea* (2), *Hakea* (4), *Lechenaultia* (1), *Leptospermum* (1), *Melaleuca* (13), *Myoporum* (3), *Nitraria* (3), *Scaevola* (1), *Westringia* (1).

Flight Phenology.

18	10	8	1	0	1	0	0	7	33	33	5
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. *Lasioglossum florale* is the most commonly collected metallic species in the dry areas of southern Australia. In the sand dunes at Eucla (Western Australia), thousands of specimens were observed forming "clouds" of insects feeding on flowering *Nitraria billarderi* (Dillon's Bush). Large numbers were collected by the author and examination showed that almost all male specimens had some degree of macrocephalic development. Among these was the first Australian *Lasioglossum* gynandromorph specimen. This displays mosaic with the head having female characters, and the remainder of the body male characters.

The development of the distal three segments of the male antenna is unique to this species. The colour on the head and mesoscutum in three male specimens, is blue rather than green.

Lasioglossum (Chilalictus) frankenia sp. nov.

Figures 51–L, 7B, 20E, 88A–H

Material examined. Holotype. ♀, South Australia, Blanche Cup Springs (29°27′S, 136°52′E), 29 Oct

1990, KLW, on *Frankenia* nr *serpyllifolia* (NMV T-15568).

Paratypes (36♀♀, 3♂). South Australia: 15♀♀, 3♂♂, same data as holotype (NMV; ♀♀ T-15569–15583, ♂♂ T-15584–15586); 19♀♀, Blanche Cup Springs (29°27′S, 136°52′E), 28 Oct 1972, H.E. Evans & TFH, on *Frankenia* (SAM); 1♀, 27 km S of Marree (29°52′S, 138°04′E), 29 Oct 1990, KLW, on *Frankenia* nr *serpyllifolia* (NMV); 1♀, Clifton Hills (27°01′S, 138°54′E), 12 Aug 1969, EME (UQIC).

Diagnosis. Head and mouthpart development unlike any other species. Both sexes metallic, with supraclypeal area and clypeus produced downward and forward, supraclypeal elongated so that clypeus entirely below lower ends of eyes; malar space present, subequal to basal width of mandible; proboscis and head variously elongated, measurements compared to HW (mean (SD); ♀, n=10; ♂, n=3); GL 0.56 (0.01) (female), 0.54 (0.01) (male); LPL 0.42 (0.01) (female), 0.41 (0.01) (male); MPL 0.80 (0.01) (female), 0.78 (0.01) (male); PML 1.17 (0.01) (female), 1.14 (1.14) (male); HL 1.18 (0.01) (female), 1.17 (0.01) (male); fore coxae reduced and rotated to obtuse angle from long axis of body, forming cavity for reception of proboscis.

Description of female. Body length 4.93–5.93 mm ($\bar{x}$=5.41 mm, SD=0.32, n=20), head width 1.29–1.35 mm (n= 20), forewing length 1.01–1.15 mm ($\bar{x}$=1.09 mm, SD=0.04, n=20). Relative dimensions: HW 100, HL 117–119, UID 60–62, LID 58–59, AOD 19–20, IAD 8–10, OAD 38–40, IOD 25–26, OOD 11–13, CL 24–26; SCL 25–26, GW 16–17, EW 26–28, SL 35–37, FL 72–74.

Structure. Head elongate (figs 5I, J; 7B), 1.18 × longer than broad; inner orbits converging slightly below; median frontal carina weak, extends to median ocellus; eyes sparsely covered with minute setae; supraclypeal area, to lesser degree clypeus and lower paraocular areas, produced downward and protuberant forward; clypeus curved laterally; in side view, supraclypeal areas produced so that a slightly elongated clypeus lies entirely below lower ends of eyes, supraclypeal area and clypeus raised above level of frons and lower paraocular areas, at distinct obtuse angle to frons, epistomal suture weakly recessed mesially, clypeus shining, indistinctly covered with shallow, openly spaced punctures; supraclypeal area covered with fine lineate pattern; malar space present, 0.9 × MW; proboscis modified (fig. 5I), measurements compared to HW (mean (SD), n=10); GL 0.56 (0.01); LPL 0.42 (0.01); MPL 0.80 (0.01); PML 1.17 (0.01). Frons (fig. 88A) elongate 0.40 × HW, above antennal bases minutely reticulate, appears to be punctate but sculpture raised above general surface, sculpture laterally weakly roughened along inner margin of eyes, frons sculpture extends to posterior margin of lateral ocelli. Labrum (fig. 88B) simple, smooth, tapered distally to narrow, rounded process with minute median keel, lateral keels absent, lateral teeth absent, lateral setae long, basal labral area almost parallel sided, 0.5 × long as wide. Scape not reaching median ocellus; paraocular areas elongate; vertex almost smooth, few, weak transverse striae. Genae smooth along outer margins of eyes, striate laterally. Pronotum dorsolaterally rounded, not projected strongly. Mesoscutum (fig. 88C) narrower than head width, anterior margin slightly produced, not bilobed, punctation moderately coarse, along anterior margin smooth, mesially to posterior margin, laterally to parapsidal areas densely punctured, minute interspaces between punctures present, punctation in parapsidal areas indistinct, weak, closely punctured. Scutellum longer than dorsal surface of propodeum, almost impunctate, transversely lineolate. Dorsal surface of propodeum (fig. 88C) defined posterolaterally by carinae, carinae well below dorsal surface, not meeting mesially, dorsal surface sculpture openly rugulose-striolate, almost reaching dorsal rim mesially, laterally smooth; posterovertical surface smooth, carinae reaching dorsal surface carinae. T1 minute, openly punctured. Mesepisternum and metepisternum smooth, weakly lineate. Legs with fore coxae reduced (fig. 20E), not meeting along midline, rotated to obtuse angle along long axis of body, forming a V-shaped cavity recessed for reception of retracted proboscis when head flexed in rest position, other coxae normal; fore tibial spur fan-shaped; hind basitibial plate rounded; inner hind tibial spur with single large tooth, distal margin sinuate; forewings with first recurrent vein entering distal extremity of second submarginal cell, almost interstitial with first cubital vein.

Colour. Frons and mesoscutum metallic green suffused with blue; basal margin of clypeus ochreous, remainder black suffused mesially with purple and blue areas; antennal flagellar segments, pedicel and distal rim of scape light ochrous brown, remainder of scape black; scutellum coppery; propodeum dark green; coxae, trochanters, basal third to half of femora black, remainder ochrous; metasoma light brown except basal half of T1 black with green sheen.

Vestiture. Lower paraocular areas of head,

entire outer margin of mesoscutum, metanotum and basal half of T1 and T2 and entire surface T3–T5 covered with white, minutely branched, adpressed hair; remainder of body sparse.

Description of male. Body length 3.85–4.08 mm ($\bar{x}$=3.98 mm, SD=0.12, n=3), head width 1.11–1.19 mm (n=3), forewing length 0.87–0.92 mm ($\bar{x}$=0.89 mm, SD=0.03, n=3). Relative dimensions: HW 100, HL 116–118, UID 62–65, LID 51–53, AOD 15–16, IAD 12–13, OAD 38–39, IOD 24–25, OOD 13–15, CL 26–27; SCL 25–26, GW 15–16, EW 33–34; ML 40–42, SL 30–32, FL 115–118.

Structure. Head elongate (fig. 5K, L) as in female, 1.17 × HW; eyes converging below; sculpture similar to female but weaker; proboscis variously elongated (fig. 5K), measurements compared to HW (mean (SD), n=3): GL 0.54 (0.01); LPL 0.41 (0.01); MPL 0.78 (0.01); PML 1.14 (0.01); labrum large as in female; mandibular length almost reaching opposite mandibular base; malar space present, 0.7 × MW. Antennae moderately long (FL 1.82 × UID), AS4:AS2+3=0.7. Remainder of body similar to female but with mesoscutal punctation with sparsely separated, indistinct, minute punctures, scutellum impunctate, dorsal surface of propodeum sculpture mainly striolate, few interconnectives, frons weak metallic colour, remainder non-metallic, basal margin of clypeus ochroleucous, mesoscutum black, propodeum dark green, metasoma black to dark green except apical margins light brown, legs as in female, basitibial plate present, pygidial plate broad, light red-brown; forewings with 2nd r-m distinctly weaker than 1st r-m.

Vestiture. Most areas of body with dense cover of white, minutely branched, adpressed hair (body appears white). Sternal vestiture without distinctive pattern, weak hair band across apical margin of S2, remainder almost bare.

Genitalia and associated sterna (figs 88E–H). Gonobase sides parallel, gonocoxite with simple setae mesolaterally and branched setae lateroapically, gonostyli long, apically swollen, with branched setae, retrorse lobes well developed, almost glabrous though with a few simple setae, ventral flanges present; S8 and S7 median processes elongate, rounded with simple setae.

Distribution (fig. 88D). Central and northeastern South Australia.

Etymology. The epithet *frankenia* refers to the food plant.

Floral Forage Record. Family visited. Catch total=3; Frankeniaceae (3 catches). Genus visited; *Frankenia* (3).

Flight Phenology.

0	0	0	0	0	0	0	1	0	2	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum frankenia is a presumed monolectic forager on *Frankenia*. Examination of the *Frankenia* floral structures may provide an explanation for the nature of the head and proboscidial modifications of *L. frankenia*. The tubular calyx of *Frankenia* is long and the petals, stamens and ovary are densely arranged inside. The claw section of each petal has a concave appendage on the inner surface which extends virtually the length of the claw to the ovary, and presumably the nectaries. To reach the nectar, the bee must push its proboscis through the stamens to be guided along the concave appendage on the inner surface of the petal claw. Modification of the slender, yet strong, prementum and associated sclerites provides a flexible tube capable of being pushed along the curved recess of the petal to the nectaries. Joined elongated maxillary palpi could begin to raise nectar to the glossa. Elongation of the head provides extra muscular attachment to the submentum and a more effective fulcrum to guide and push the proboscis through the stamens and into the claw appendage. Observations of the bees at flowers add support this theory. The bees were seen with just the tip of the metasoma at the entrance of the flower and were positioned towards one side of the tubular calyx.

Lasioglossum (Chilalictus) froggatti sp. nov.

Figures 89A–E

Material examined. Holotype. ♂, New South Wales, Moree (29°28′S, 149°51′E), 10 May 1914, W.W. Froggatt (QM T13907, genitalia removed, placed in vial attached to pin.)

Diagnosis. Most like *L. roddi*. Male with antennae moderately short (FL 1.3 × UID), AS4:AS2+3=0.5, frons finely striate, mesoscutum shining, mesially open to closely punctate, densely punctate in parapsidal areas, mesoventral area with two small, juxtaposed processes, dorsal surface of propodeum micro-alveolate, not defined by carinae, S2 and S3 with sparse row of erect, posteriorly directed, branched hair, forewings with 2nd r-m weaker than 1st r-m.

Description of male (female unknown). Body length 4.47mm, head width 1.27mm, forewing

length 1.18mm. Relative dimensions: HW 100, HL 88, UID 72, LID 54, AOD 20, IAD 14, OAD 29, IOD 21, OOD 25, CL 20, GW 22, EW 24; ML 45, SL 30, FL 94.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Antennae moderately short (FL 1.3 × UID), AS4:AS2+3=0.5. Scape reaching just short of median ocellus. Clypeus short, surface shining, basal half at distinct angle to posterior half, anterior half slightly concave, almost impunctate, pale yellow, posterior half densely punctate with small, round punctures, supraclypeal area flat, shining, openly punctate. Frons above antennal bases finely and weakly striate, laterally sculpture weakens to smooth, vertically extends to anterior margin of median ocellus; vertex broad, ocelloccipital area broad, smooth and shining. Pronotum dorsolaterally rounded, not projected. Mesoscutum anterior margin rounded, surface shining to highly polished, mesially open to closely punctate, densely punctate in parapsidal areas; mesoventral area with two small, juxtaposed, apically rounded processes set at right angles to body. Scutellum 1.6 × longer than dorsal surface of propodeum, surface polished, impunctate. Dorsal surface of propodeum not defined by carinae, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture micro-alveolate with a few weak striae along basal margin, dorsal rim smooth, shining, curved gently to vertical surface. Metasomal T1 almost impunctate, with a few sparsely separated minute punctures. Mesepisternum and metepisternum smooth, polished. Forewings with 2nd r-m weaker than 1st r-m; BP broadly rounded.

Colour. Body and legs light brown colour, sclerites partially transparent.

Vestiture. Body sparse, lower paraocular area with some short, adpressed, plumose hair, frons and mesoscutum with a few weakly branched hairs, scutellum glabrous, mesoventral area almost glabrous, with a few short, simple setae, metasomal tomentum absent; S2 and S3 with sparse row of erect, posteriorly directed, branched hair, S4–S6 with simple, adpressed hair, posteromesially directed.

Genitalia and associated sterna (figs 89B–E). Gonobase sides parallel, gonocoxite with lateral setae present, gonostyli long, with short hair except a few long, thickened setae apically, retrorse lobes weak, raised inner margin with stout, thickened setae, apical lobe weakly projected, ventral flanges absent; S8 median process elongate, narrow, apically rounded with simple setae, S7 median process rounded, glabrous.

Distribution (fig. 89A). Known from a single locality at Moree, New South Wales.

Etymology. The epithet *froggatti* is in recognition of W.W. Froggatt's contribution to Australian entomology.

Floral Forage Record. None available.

Flight Phenology.

0	0	0	0	1	0	0	0	0	0	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Known from a single specimen, this species is described to fully illustrate the range of male mesoventral processes and unusual reduction of the genital capsule gonocoxite retrorse lobes. The specimen has slight macrocephaly expressed as development of the vertex. The colours of the specimen are quite leached and faded due either to being collected freshly emerged without allowing time for full tanning of the colours, or to being stored in alcohol for a considerable period before being pinned.

Lasioglossum (Chilalictus) gilesi (Cockerell)

Figures 90A–H

Halictus gilesi Cockerell, 1905b: 304.
Halictus circumdatus Cockerell, 1914a: 512. syn. nov.
Halictus evasus Cockerell, 1930: 45. syn. nov.
Halictus milleri Rayment, 1935: 709. syn. nov.
Lasioglossum (*Chilalictus*) *gilesi*. — Michener, 1965: 176.
Lasioglossum (*Chilalictus*) *circumdatum*. — Michener, 1965: 175.
Lasioglossum (*Chilalictus*) *evasum*. — Michener, 1965: 176.
Lasioglossum (*Chilalictus*) *milleri*. — Michener, 1965:177.

Material examined. Holotype of *gilesi*. ♀, Victoria, 89.108., BM Type Hym 17.a.916 (BMNH, missing the right antenna and the metasoma has been dislodged and glued to the card).

Holotype of *circumdatus*. ♀, Victoria, Rutherglen (36°03′S, 146°28′E), Freneh, 174, BM Type Hym 17.a.970 (BMNH, missing the left forewing, left midleg, left tarsi and the head has been dislodged and reglued to the body.).

Holotype of *evasus*. ♀, Queensland, Coolangatta (28°10′S, 145°16′E), 6 Sep 1913, A.J. Turner (QM, T-4100).

Holotype of *milleri*. ♀, Victoria, Bayswater (37°51′S, 145°16′E), 3 Jan 1915, F.S. (ANIC).

Other specimens examined (320♀♀, 73♂♂). Queensland: Gayndah, Murgon, Noosa, Kingaroy, Condam-

ine, Crows Nest, Middle Ridge, Aratula, Leyburn, Sunnybank, Warwick, Amiens.

New South Wales and Australian Capital Territory: Woodenbong, Legume, Mt Kaputar, Narrabri, Armidale, Gunnedah, Coonabarabran, Binnaway, Bulahdelah, Doonside, Cabramatta, Curlwaa, Wentworth, Wentworth, Bungendore, Canberra, Conargo, Tintinara, Moruya, Nadgee Reserve.

Victoria: Murrabit, Koorangie, Kerang, Rutherglen, Wilkur, Echuca, Euroa, Halls Gap, Broadford, Taggerty, Dunkeld, Cann River, Coranderrk, Melbourne, Orbost, Warburton, Lakes Entrance, Lakes Entrance, Emerald, Gorae West, Jeeralang, Lorne, Gellibrand.

Tasmania: George Town, St Patricks River, Nunamara, Launceston, Hobart.

South Australia: Waterfall Gully, Lake Gilles Nat. Pk., Leighton, Morgan, Portee, South Para, Port Lincoln, Athelstone, Wellington, Adelaide, Toorak, Tusmore, Finniss, Mt Compass, Meningie, Coorong, Kongal, Rendelsham, Port Elliot, Robe, Millicent.

Diagnosis. Like *L. speculatum*. Both sexes with body black. Female with frons reticulate, mesoscutum bilobed anteriorly, punctation moderately coarse, dorsal surface of propodeum striate, defined by posterolateral carinae, dorsal rim weakly recessed mesially. Male with antennae moderately long, S3 and S4 with dense, long, plumose hair across posterior margins; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.32–9.86 mm ($\bar{x}$=8.72 mm, SD=0.54, n=20), head width 2.19-2.45 mm (n=20), forewing length 2.16–2.61 mm ($\bar{x}$=2.41 mm, SD=0.13, n=20). Relative dimensions: HW 100, HL 78–82, UID 57–59, LID 54–56, AOD 20, IAD 10–12, OAD 23–25, IOD 15–17, OOD 14–16, CL 19, GW 17–24, EW 23–26, SL 40–43, FL 71–75.

Structure. Head wider than long, inner orbits converging below, median frontal carina reaches median ocellus, eyes with very short, sparse setae. Scape reaching well beyond lateral ocelli. Clypeus relatively short (CL 0.35 × LID), weakly convex, shining except along basal margin with weak transverse lineolation, large elliptical punctures dense to closely arranged; supraclypeal area broad and weakly protruded, shining, closely punctured. Frons (fig. 90A) reticulate, sculpture extends to level of lateral ocelli. Labrum (fig. 90B) basal median area raised to distal margin, surface roughened, distal process not tapered, widest at base, median keel extends beyond distal margin, lateral ridges serrate, extend to distal margin, lateral teeth present, large, distally hooked. Pronotum dorsolateral angles obtuse, projecting; Mesoscutum (fig. 90C) bilobed anteriorly, punctation moderately coarse, mesially interspaces between puncture shining, closely to densely punctate, dense in parapsidal areas. Scutellum 1.2 × longer than dorsal surface of propodeum, shining, doubly punctate. Dorsal surface of propodeum (fig. 90C) defined by posterolateral carinae set below dorsal surface, posterovertical surface transversely plicate, carinae reach posterolateral carinae, dorsal surface striate to porcate (some specimens with a few transverse cross-veins mesially), sculpture not reaching rim, dorsal rim weakly recessed mesially. Mesepisternum and metepisternum with horizontal striae; BP rounded.

Colour. Body black except, mandibles apically red-brown, legs and flagellar segments underneath dark brown.

Vestiture. Body sparse; face and mesoscutum with erect, minutely branched hair; strong tomentum on T2–T4.

Description of male. Body length 6.54–8.24 mm ($\bar{x}$=7.01 mm, SD=0.49, n=10), head width 1.85–2.16 mm (n=10), forewing length 1.64–2.07 mm ($\bar{x}$=1.84 mm, SD=0.11, n=10). Relative dimensions: HW 100, HL 81–82, UID 58–62, LID 44–46, AOD 15–17, IAD 12–13, OAD 25–26, IOD 18, OOD 15–16, CL 20–21, GW 14–16, EW 30–31; ML 35–38, SL 27–31, FL 117–123.

Structure. Head broad; inner orbits converging below, eyes with sparse, minute setae; sculpture similar to female except clypeus and supraclypeal area entirely shining, clypeus openly punctured; basal three-quarters of clypeus with pale yellow marking. Antennae moderately long (FL 1.98 × UID), AS4:AS2+3=1. Remainder of body similar to female but with mesoscutal punctation mesially close, scutellum not doubly punctate, dorsal surface of propodeum rugulosо-striolate, extending to rim, dorsal surface posterior carinae weak, not present in some specimens, posterovertical carinae and plicae present; legs either all dark brown or tibiae, tarsi, apical half of mid and hind femora and apical quarter of fore femora light red-brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Head with adpressed plumose hair in paraocular areas, simple hair above antennal bases; S3 and S4 with dense, long, plumose hair across posterior margins.

Genitalia and associated sterna (figs 90E–H). Gonobase sides flanged basally, gonocoxite setose on apical inner margin, gonostyli with long, simple setae, retrorse lobes setose, well

developed, ventral flanges present; S8 and S7 median processes rounded, with simple setae.

Distribution (fig. 90D). Eastern zone of the Bassian province.

Floral Forage Record. Families visited=17. Catch total=58; Anacardiaceae (1 catch), Bignoniaceae (1), Boraginaceae (1), Compositae (1), Cupressaceae (1), Dilleniaceae (1), Fabaceae (9), Iridaceae (1), Liliaceae (1), Malvaceae (1), Myrtaceae (33), Pittosporaceae (2), Rosaceae (1), Santalaceae (1), Sapindaceae (1), Saxifragaceae (1), Sterculiaceae (1). Genera visited=24; *Acacia* (5), *Angophora* (1), *Atalaya* (1), *Bauera* Banks & Andr. (1), *Borago* (1), *Bursaria* (2), *Callistemon* (1), *Cassia* (1), *Cotoneaster* (1), *Daviesia* (1), *Dichopogon* (1), *Eucalyptus* (26), *Exocarpus* (1), *Gladiolus* L. (1), *Hibbertia* (1), *Jacksonia* (1), *Juniperus* L. (1), *Lagunaria* (1), *Lavatera* L. (1), *Medicago* (1), *Melaleuca* (5), *Schinus* (1), *Senecio* (1), *Thomasia* J. Gray (1).

Flight Phenology.

25	15	13	7	0	1	0	1	14	12	28	16
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Intraspecific variation is restricted to male leg colour. Males from Goondiwindi, Yass and east Gippsland have light red-brown legs while all other males have dark brown legs. Examination of genitalia confirmed conspecificity of leg colour morphs.

Lasioglossum (Chilalictus) globosum (Smith)

Figures 16A, 20C, 28D, 91A–H

Halictus globosus Smith, 1853: 59–60.

Lasioglossum (*Chilalictus*) *globosum*. — Michener, 1965: 176.

Material examined. Holotype, ♀, New Holland (Australia), Ent. Club 44-12, BM Type 17.a.899 (BMNH, missing left hind tibia and tarsi, right mid leg and metasoma glued to a card.)

Other specimens examined (45♀♀, 20♂♂). New South Wales: Wagga Wagga, Sydney, Junee.

Victoria: Baechus Marsh, Balmoral, Bendigo, Kiata, Echuca.

Tasmania: Hobart, Branxholm.

South Australia: Coorong Nat. Park, Kangaroo Island, Cape Jervis, Goolwa, Monarto, Adelaide, Port Lincoln, Gilberton, Salisbury, Cummins, Glenunga, Cummins, Orroroo.

Diagnosis. Most like *L. clariventre*. Both sexes with body black. Female with frons coarsely striate, labrum distally flanged, mesoscutum punctation fine, surface dull, with circular pattern on each mesoscutal half, parapsidal areas almost impunctate, dorsal surface of propodeum ruguloso-striolate, weakly defined by posterolateral carinae, T1 almost impunctate. Male with antennae moderately short, clypeus black, face with dense hair forming a mat, genae with dense hair forming a beard, S2 and S3 with long, plumose, posteriorly directed hair, hair longer on S2, shorter on S3, on S4 and S5 forming inverted V-shape mesially, laterally forming weak tuft; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 5.47–7.85 mm ($\bar{x}$=6.99 mm, SD=0.67, n=11), head width 1.67–2.07 mm (n=11), forewing length 1.46–1.90 mm ($\bar{x}$=1.81 mm, SD=0.13, n=11). Relative dimensions: HW 100, HL 76–80, UID 64–66, LID 57–58, AOD 21–23, IAD 11–12, OAD 26–27, IOD 20–21, OOD 18–19, CL 18–20, GW 18–20, EW 20–22, SL 37–40, FL 62–65.

Structure. Head broad, inner orbits converging below, median frontal carina well developed, extends to median ocellus, eyes with sparse cover of minute setae. Scape reaches anterior margin of lateral ocelli. Clypeus short (CL 0.34 × LID), convex, shining except posterior margin dull, basally almost impunctate, few large puncture along anterior margin, remainder with sparsely separated, minute punctures, supraclypeal area projected, dull, weak circular lineolation, weak, openly punctate. Frons (fig. 91A) above antennal bases coarsely striate, laterally sculpture weaker with smooth margin along inner orbits, sculpture extends around eyes onto genae. Labrum (fig. 91B) basal median area slightly raised, weakly nodulated, distal process not widest at base, distally flanged, median keel spatulate, extends just beyond setose distal margin, lateral ridges absent, lateral teeth, small, not hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 91C) anterior margin rounded, punctation fine, surface dull except small mesial areas shining, covered with circular, lineolation, complete circle on each mesoscutal half, pattern extends along midline, anteriorly impunctate, mesially open-closely punctate, parapsidal areas almost impunctate, few, indistinct punctures. Scutellum 1.3 × longer than dorsal surface of propodeum, two circular line patterns on each half with smooth, shining area in middle of each, open to closely punctate. Dorsal surface of propodeum (fig. 91C) weakly defined by posterolateral carinae, carinae well below dorsal surface, posterovertical carinae extend at least half way to dorsal level, dorsal sculpture ruguloso-striolate mesially, striolate laterally, sculpture not reach-

ing dorsal rim, surface covered with fine, reticulate pattern. T1 almost impunctate, covered with transverse lineolation (fig. 16A). Mesepisternum and metepisternum weakly striate. BP rounded.

Colour. Body black except mandibles red-brown apically, flagellar segments brown, metasoma dark brown with anterior margins of tergites light brown, legs black, some specimens with dark brown tibiae and tarsi.

Vestiture. Body moderately sparse, head and mesoscutum sparsely covered with long, erect, branched hair, except frons with shorter, minutely branched hair, mesoventral hair minutely branched, weak tomentum present laterally on T2 and T3, some tomentous hair across T4.

Description of male. Body length 5.78–6.62 mm ($\bar{x}$=6.16 mm, SD=0.27, n=10), head width 1.65–2.00 mm (n=10), forewing length 1.53–1.81 mm ($\bar{x}$=1.63 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 86–88, UID 70–71, LID 54–55, AOD 19–20, IAD 13–15, OAD 24–26, IOD 20–21, OOD 20–22, CL 20–22, GW 18–22, EW 24–26; ML 39–40, SL 32–34, FL 105-108.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of minute setae, clypeus black, without pale yellow marking, frons striate. Antennae moderately short (FL 1.52 × UID), AS4:AS2+3=0.7 (fig. 20C). Remainder of body similar to female with mesoscutal similar circular patterns, dorsal surface of propodeum not defined by posterolateral carinae, T1 impunctate, mesoventral area with short, adpressed and simple hair; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Clypeus, supraclypeal area and paraocular areas densely covered with adpressed, branched, white hair forming a mat, frons with similar hair except not adpressed; genae with dense, branched hair forming a beard; S2 and S3 with long, plumose, posteriorly directed hair, S2 hair longer than on S3, S4 and S5 with adpressed, mesially branched hair forming inverted V-shape, laterally hair raised forming weak tuft, S6 with some simple hair (fig. 28D).

Genitalia and associated sterna (figs 91E–H). Gonobase sides narrowed basally, gonocoxite without setae, gonostyli swollen apically, setae short, simple, a few thickened setae apically, retrorse lobes setose, well developed along ventral margin only, ventral flanges absent, penis valves weakly flanged dorsally; S8 median process elongate, rounded with simple setae; S7 median process rounded, glabrous.

Distribution (fig. 91D). Eastern zone of the Bassian province with few records from north of Victoria.

Floral Forage Record. Families visited=6. Catch total=16; Aizoaceae (2 catches), Compositae (5), Fabaceae (3), Myrtaceae (4), Oxalidiaceae (1), Scrophulariaceae (1). Genera visited=11; *Arctotheca* (3), *Calytrix* (1), *Carpobrotus* (2), *Craspedia* (1), *Daviesia* (1), *Eucalyptus* (3), *Medicago* (1), *Oxalis* (1), *Pultenaea* (1), *Senecio* (1), *Veronica* (1).

Flight Phenology.

0	0	0	0	0	1	0	0	10	9	6	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The type locality label of *L. globosus* reads "New Holland" but Smith's description nominates Van Diemen's Land (Tasmania) as the type locality. The short male antennae and impunctate metasomal T1 of both sexes are unusual character states within the subgenus.

Lasioglossum (Chilalictus) greavesi (Rayment)

Figures 92A–H

Halictus greavessi Rayment, 1930: 53.

Halictus greavesi. — Rayment, 1931: 168.

Lasioglossum (Chilalictus) greavessi. — Michener, 1965: 176.

Lasioglossum (Chilalictus) greavesi. — Cardale, 1993: 192.

Material examined. Holotype of *greavesi*, ♀, Western Australia, Bungulla (31°37′S, 117°35′E), 11 Jan 1929 (published as 1 October), Rayment, 54e (ANIC, missing right hind leg and distal four flagellar segments of left antenna; head and metasoma reglued to mesosoma, left wings attached to large drop of glue.)

Other specimens examined (155♀♀, 80♂♂). New South Wales: Fowlers Gap Res Stn.

South Australia: Shea Oak Log, Port Germein, Whyalla, Pimba, Hawker, Edeowie HS, Wilpena, Parachilna, Lake Hart, Moolawatana, Leigh Creek South, Roxby Downs, Copley, Flinders Range, Marree, William Creek.

Western Australia: Hatter Hill, Norseman, Balladonia, Hyden, Bungulla, Baandee, Merredin, Yellowdine, Moorine Rock, Southern Cross, Boorabbin Rock, Weowanie Rock, Coolgardie, Kalgoorlie, Broad Arrow, Carnarvon, Newman, Onslow.

Diagnosis. Like *L. florale.* Female with head and mesosoma dull metallic green with coppery tinge, metasomal tergites light red-brown with anterior half of T1 dark green, frons striate, mesoscutum dull, covered with conspicuous

reticulate pattern, mesially openly to closely punctate, dorsal surface of propodeum rugulosostriolate, defined by posterolateral carinae set well below dorsal level, fore tibial spur fan shaped. Male with frons dark green with dull metallic copper sheen, mesoscutum with dull metallic green sheen, metasoma brown, antennae moderately short (FL 1.47 × UID), AS4:AS2+3=0.7, S2–S4 with short, branched hair, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 3.62–4.54 mm ($\bar{x}$=4.07 mm, SD=0.31, n=10), head width 1.22–1.39 mm (n=10), forewing length 0.96–1.08 mm ($\bar{x}$=1.02 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 80–82, UID 64–65, LID 60–61, AOD 19–20, IAD 12–14, OAD 34–36, IOD 24–26, OOD 16–17, CL 17–19, GW 17–18, EW 26–27, SL 35–36, FL 70–72.

Structure. Head broadly triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches just short of median ocellus. Clypeus short (CL 0.31 × LID), weakly convex, in some specimens median area slightly concave, ventrolaterally shining and impunctate, ventromesially with dull sheen, covered with fine reticulate pattern, with a few broad, shallow punctures, anteriorly dull with fine reticulate pattern, openly to closely punctate with small, shallow, rounded punctures, supraclypeal almost flat, dull with reticulate pattern coarser than on clypeus, sparsely punctate. Frons (fig. 92A) above antennal bases finely striate, laterally striations extends almost to inner margin of orbits, along inner margin punctate, vertically extends to at least anterior margin of lateral ocelli. Labrum (fig. 92B) median basal area forming raised V-shaped tubercles, anterior margin rounded mesially, raised forming curved lip, distal process triangular, widest at base, median keel extends to distal margin, lateral ridges small, almost on lateral margin, setae not present across distal margin, lateral teeth absent. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 92C) anterior margin rounded, surface dull, covered with conspicuous fine reticulate pattern, punctation fine, anteriorly impunctate, mesially openly to closely punctate with small, shallow, rounded punctures, parapsidal area openly punctate with similar punctures. Scutellum length equal to dorsal surface of propodeum, surface dull, sparsely to openly punctate except closely punctate along midline. Dorsal surface of propodeum (fig. 92C) defined by posterolateral carinae set well below dorsal level, carinae angular, posterovertical carinae meet dorsal carinae, dorsal sculpture coarsely ruguloso-striolate with a few striae laterally, sculpture almost reaches dorsal rim mesially, not laterally, rim dull. Metasomal T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum striate. Fore tibial spur fan shaped; BP rounded.

Colour. Head and mesosoma with dull metallic green to coppery tinge, metasoma brown or light red-brown, basal half of clypeus black except ventrolateral corners amber, anterior half with metallic copper to blue tinge, mandibles amber, dark red-brown apically, antennal flagellum light brown underneath, mesoscutum and scutellum with dull copper tinge, propodeum black to dark green, metasomal tergites light red-brown with posterior half of T1 dark green (a few specimens with dark brown on posterior half of all tergites), legs light red-brown except basal one third of femora brown.

Vestiture. Body sparse, frons and paraocular areas with sparse, erect, branched hair, mesoscutum with similar hair except posterior margin with hair tuft across margin, weak metasomal tomentum laterally on T2.

Description of male. Body length 3.16–3.46 mm ($\bar{x}$=3.31 mm, SD=0.10, n=10), head width 0.99–1.78 mm (n=10), forewing length 0.80–0.99 mm ($\bar{x}$=0.90 mm, SD=0.06, n=10). Relative dimensions: HW 100, HL 80–82, UID 67–68, LID 56–58, AOD 17–18, IAD 14–15, OAD 32–33, IOD 27–28, OOD 15–16, CL 16–17, GW 17–18, EW 28–30; ML 43–46, SL 29–31, FL 98–100.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of minute setae, median frontal carina reaches median ocellus, clypeus anterior margin slightly concave, surface smooth, shining, impunctate, basal half bright yellow, supraclypeal area flat, with a dull sheen, impunctate. Antennae moderately short (FL 1.47 × UID), AS4:AS2+3=0.7. Remainder similar to female, frons coarsely striate, pronotum dorsolateral angles not projected, mesoscutum with dull sheen, covered with fine reticulate pattern, appear impunctate, sparsely to openly punctate with small, shallow, indistinct punctures, scutellum shining, impunctate, propodeum posterolateral carinae weakly present, sculpture coarsely rugulose with a few interconnectives mesially; colour of mandibles and clypeus bright yellow, antennal flagellum light

brown underneath, frons dark green with dull metallic copper sheen, mesoscutum with dull metallic green sheen, metasoma brown with green sheen, legs as in female; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, frons with a few erect, minutely branched hairs, paraocular areas with some adpressed, plumose hair, not forming a mat, mesoscutum with sparse cover of short hair, metasomal tomentum absent; S2–S4 with short, posteriorly directed, minutely branched hair across posterior margin of sternites, S5 and S6 with sparse cover of adpressed simple and minutely branched hair.

Genitalia and associated sterna (figs 92E–H). Gonobase sides slightly narrowed basally, gonocoxite without setae, gonostyli long, densely covered with long, branched hair, retrorse lobes glabrous, well developed, ventral flanges present; S8 median process elongated, broadly rounded and with weakly branched setae apically, S7 median process rounded, with a few setae.

Distribution (fig. 92D). Southern areas of the Eyrean province following the "mallee" region, but is divided into two eastern and western populations; a few specimens have been recorded from northwestern Western Australia.

Floral Forage Record. Families visited=15. Catch total=49; Amaranthaceae (1 catch), Anacardiaceae (3), Chenopodiaceae (1), Compositae (1), Fabaceae (2), Frankeniaceae (2), Liliaceae (1), Loranthaceae (1), Myoporaceae (3), Myrtaceae (21), Proteaceae (5), Sapindaceae (3), Scrophulariaceae (2), Solanaceae (2), Zygophyllaceae (1). Genera visited=21; *Acacia* (1), *Amyema* (1), *Anthocercis* (1), *Asphodelus* (1), *Atalaya* (2), *Crotalaria* (1), *Eremophila* (2), *Eucalyptus* (14), *Frankenia* (2), *Hakea* (5), *Helichrysum* (1), *Heterodendrum* (1), *Melaleuca* (6), *Myoporum* (1), *Nicotiana* (1), *Nitraria* (1), *Ptilotus* R.Br. (1), *Salsola* (1), *Schinus* (3), *Stemodia* (2), *Thryptomene* (1).

Flight Phenology.

11	6	0	0	0	0	0	0	2	22	11	4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Males of *L. greavesi* superficially resemble, and could be easily mis-identified as *Homalictus urbanus* (Smith). *L. greavesi* can be recognised by the punctation on T1 and the sternal vestiture. Several males showed weak macrocephaly through enlargement of the genae and lengthening of the mandibles.

The epithet has been the subject of some confusion. Rayment (1930: 53) "dedicated the species to the collector, Mr. Tom Greaves" but added the suffix *-si* to the name *greaves* which gave the published epithet *greavessi*. Rayment (1931, p. 168) next used the epithet *greavesi*, though made no mention that this was an emendation of *greavessi*. Michener (1965) listed the original published epithet as he either did not know of or did not accept Rayment's 1931 emendation. Cardale (1993) reused the emended *greavesi* in her catalogue, citing Rayment's (1931) use of "greavesi" as an emendation of the epithet "greavessi". The addition of "si" to the name "greaves" was an incorrect suffix when dedicating the epithet after Mr Tom Greaves, and I accept Rayment's (1931) emendation of adding only "i" to the name.

Lasioglossum (Chilalictus) grumiculum sp. nov.

Figures 93A–E

Material examined. Holotype, ♂, New South Wales, Nadgee Reserve, 7 km N of Newtons Beach (37°22′S, 149°55′E), 2 Jan 1986, E.A. Sugden (AM).

Paratypes (3♂♂). New South Wales: 1♂, Royal National Park (34°08′S, 151°04′E), 4 Dec 1970, D.K. McAlpine, on leaves of *Xanthorrhoea* (AM); 1♂, Nadgee Reserve, Merrika Lodge (37°22′S, 149°55′E), 13 Jan 1987, E.A. Sugden, on *Hakea teretifolia* (AM); 1♂, same locality and collector, 10 Jan 1987, on *Kunzea ericoides* (AM).

Diagnosis. Most like *L. cephalochilum*. Male with head and mesosoma black, metasoma brown, antennae moderately long (FL 1.5 × UID), AS4:AS2+3=0.5, mesoventral area with two small, broadly rounded, widely separated processes, mesoventral processes densely covered with hair forming a mat, S2–S4 with posterior directed, plumose hair across sterna, forewings with 2nd r-m as strong as 1st r-m.

Description of male (female unknown). Body length 4.70–4.93 mm ($\bar{x}$=4.85 mm, SD=0.11, n=4), head width 1.41–1.57 mm (n=4), forewing length 1.20–1.27 mm ($\bar{x}$=1.23 mm, SD=0.03, n=4). Relative dimensions: HW 100, HL 86–87, UID 63–64, LID 44–46, AOD 15–16, IAD 15–16, OAD 28–29, IOD 19–20, OOD 17–18, CL 20–21, GW 14–16, EW 31–32; ML 38–39, SL 28–29, FL 94–96.

Structure. Head broad, inner orbits converging below, median frontal carina extends about half way to median ocellus, eyes with sparse cover of minute setae. Antennae moderately long (FL 1.5 × UID), AS4:AS2+3=0.5. Scape

reaching not reaching median ocellus. Clypeus flat, shining, basally pale white/yellow, indistinctly roughened with shallow depressions, anteriorly black, with a few rounded punctures, supraclypeal area well projected mesially, shining, impunctate. Frons above antennal bases striate to reticulate, laterally sculpture weakens to punctate, vertically extends to anterior margin of lateral ocelli. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum anterior margin with weak mesial projection, surface shining, punctation moderately coarse, anteriorly dull and impunctate, mesially closely to densely punctate, laterad of parapsidal lines and in parapsidal areas densely punctate; mesoventral area with two small, broadly rounded, widely separated proccsses, area between proeesses deeply rccessed. Scutellum 1.2 × longer than dorsal surfacc of propodeum, surface shining, openly punctate. Dorsal surface of propodeum not defined by carinae, posterovcrtical carinae extend less than half way to dorsal level, dorsal sculpture ruguloso-striolate with a fcw striae laterally, seulpturc almost extends to rim, dorsal rim smooth and shining, curved gently to vertical surfaee. T1 open to closely punctate. Mescpisternum and mctepisternum shining, striate. Forewings with 2nd r-m as strong as 1st r-m; BP bluntly angular.

Colour. Head and mesosoma blaek, metasoma brown, except mandibles palc amber, apically red-brown, antennal flagcllum dark brown underncath, legs brown except tarsi light red-brown.

Vestiture. Frons with erect simple and minutely branched hair, lower paraocular area with some short, adpressed, plumose hair, not forming a mat, mesoscutum with sparse eover of short, simple hair, mesoventral processes densely covered with short, adprcssed, minutely plumose hair forming a mat, mctasomal tomentum absent, S2–S4 with posterior dirccted, plumose hair across sterna, S2 hair longer than S4 hair.

Genitalia and associated sterna (figs 93B–E). Gonobase sides flanged basally, gonocoxite with setose apical inner margin, gonostyli long, apically broad, with simplc hair, retrorse lobes setose, well devcloped, ventral flanges present; S8 median proccss short, apically rounded, with single setum, S7 median process rounded, glabrous.

Distribution (fig. 93A). Coastal areas of southern New South Wales.

Etymology. The epithet *grunniculum* means "a small mound" and refers to the short, broadly rounded mesoventral processes on the male.

Floral Forage Record. Families visited=2. Catch total=2; Myrtaceae (1 catch), Proteaceae (1). Genera visited=2; *Hakea* (1), *Kunzea* (1).

Flight Phenology.

3	0	0	0	0	0	0	0	0	0	0	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Lasioglossum (Chilalictus) gunbowerense (Rayment)

Figures 26B, 94A–H

Halictus gunbowerensis Rayment, 1939: 280.
Lasioglossum (Chilalictus) gunbowerense. — Michener, 1965: 176.

Material examined. Holotype. ♀, Victoria, Gunbower (35°58′S, 144°22′E), 3 March 1933, Rayment (ANIC, missing right hind femur, tibia and tarsi.)

Other spccimcns cxamined (226♀♀, 32♂♂). Queensland: Goondiwindi, Toobeah, Yuleba, Roma, Mt Isa, Talawanta.

New South Wales and Australian Capital Territory: Narromine, Warren, Cobar, Coonabarabran.

Victoria: Gunbower, Kerang.

South Australia: Whyalla, Lake Gillcs Nat. Pk, Oodla Wirra, Wilmington, Quorn, Wilpcna, Copley, Mt Serle.

Northern Territory: Glen Helen.

Wcstern Australia: Norseman, Balladonia, Norseman, McDermid Rock, York, Higginsville, Northam, Merredin, Nukarni, Yellowdine, Southern Cross, Nungarin, Coolgardie, Mukinbudin, Koolyanobbing, Boulder, Kalgoorlie.

Diagnosis. Like *L. appositum* but with unique colour and sculpture patterns. Female with head metallic green with eopper tinge, mesoscutum cmerald green, metasoma light red-brown and brown banded or dark brown, inner orbits slightly diverging below, frons striate, mesoscutum shining, mesially and in parapsidal areas closc to densely punctate, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae set well below dorsal level, fore tibial spur fan shaped. Male with frons dark green with gold tinge, mesoscutum blue green, propodeum dark brown, metasoma light brown, antennae modcrately long (FL 2.16 × UID), AS4:AS2+3=1, metasomal S3 and S4 emarginate, S4 broadly so, forming lateral flanges, S4 with two small process mesially, S2 with long, erect, minutely branched hair, postcrior margin of S2 and S3 with shorter, posteriorly directed hair, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.62–5.85 mm ($\bar{x}$=5.23 mm, SD=0.43, n=10), head width 1.53–1.72 mm (n=10), forewing length 1.25–1.46 mm ($\bar{x}$=1.34 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 83–85, UID 55–56, LID 57–60, AOD 20–21, IAD 10–12, OAD 30–31, IOD 22–24, OOD 10–11, CL 19–21, GW 19–20, EW 27–29, SL 34–35, FL 66–69.

Structure. Head broadly triangular, inner orbits slightly diverging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape just reaches anterior margin of median ocellus. Clypeus short (CL 0.35 × LID), convex though distinctly concave along midline, entire surface shining, concave area closely punctate with small, shallow punctures, remainder sparsely punctate with minute punctures, supraclypeal area raised, polished, openly punctate. Frons (fig. 94A) above antennal bases striate, laterally sculpture weakens to punctate along inner margins of eyes, vertically extends to anterior margin of lateral ocelli. Labrum (fig. 94B) median basal area forming raised V-shaped tubercles, anterior margin rounded mesially, forming raised lip along margin, distal process triangular, widest at base, median keel thickened, extends to distal margin, lateral ridges large, recurved basally towards median keel, setae not present across distal margin, lateral teeth absent. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 94C) anterior margin rounded, surface shining, punctation moderately coarse, anteriorly impunctate, mesially and in parapsidal areas close to densely punctate, interspaces always present. Scutellum length equal to dorsal surface of propodeum, surface smooth and highly polished, sparely punctate except densely punctate along midline, puncture minute. Dorsal surface of propodeum (fig. 94C) defined by posterolateral carinae set well below dorsal level, carinae angular, posterovertical carinae reach dorsal carinae, dorsal sculpture coarsely ruguloso-striolate, almost reaches rim mesially, not laterally, dorsal rim smooth, gently rounded to vertical surfaces. T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum smooth and shining. Fore tibial spur fan-shaped; BP rounded.

Colour. Head metallic green with copper tinge, mesoscutum emerald green, metasoma light red-brown and brown banded or dark brown, mandibles yellow, apically red-brown, basal portion of clypeus amber, remainder brown, antennal scapes and flagellum light yellow-brown, metasoma varies, either posterior half of T1 dark green, remainder light red-brown, or anterior half of tergites dark brown, posterior half light red-brown, or (specimens from eastern states) metasoma dark black green, legs entirely light red-brown.

Vestiture. Lower frons, paraocular areas and genae with short, adpressed, minutely plumose hair forming a mat, mesoscutum almost glabrous except along lateral and posterior margin tomentum of short, adpressed hair (fig. 94C), mesepisternum with dense cover of adpressed, plumose hair, metanotum with dense tomentum of short hair, metasomal tomentum laterally on T2 and T3.

Description of male. Body length 4.00–4.77 mm ($\bar{x}$=4.39 mm, SD=0.26, n=10), head width 1.29–1.55 mm (n=10), forewing length 1.03–1.34 mm ($\bar{x}$=1.10 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 82–84, UID 59–61, LID 54–58, AOD 15–17, IAD 15–16, OAD 26–28, IOD 23–25, OOD 13–14, CL 19–20, GW 18–23, EW 30–32; ML 38–48, SL 26–30, FL 130–132.

Structure. Head broadly triangular, inner orbits converging below except parallel to slightly diverging in specimens with macrocephaly, median frontal carina reaches median ocellus, clypeus smooth and shining, gently concave mesially, anterior two thirds bright yellow, supraclypeal area flat, shining. Antennae moderately long (FL 2.16 × UID), AS4:AS2+3=1. Remainder similar to female, frons striate, pronotum dorsolateral angles not projected, mesoscutum smooth and polished, openly punctate with minute punctures, scutellum smooth, polished and impunctate, dorsal surface of propodeum not defined by carinae, dorsal surface smooth and polished, with a few striae basally; colour of mandibles, clypeus and antennal scapes yellow, flagellum light yellow-brown underneath, frons dark green with gold tinge, mesoscutum blue green, propodeum dark brown, metasoma light brown, legs as in female; metasomal S3 and S4 emarginate, S4 broadly so, forming lateral flanges, S4 with two small median processes, processes separated by distance smaller than IAD (fig. 26B); forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower frons, paraocular areas and supraclypeal area dense covered with short adpressed hair forming a mat, mesoscutum almost glabrous except for thin line of hair on lateral and posterior margins, metasomal tom-

entum absent; S2 with long, erect, minutely branched hair, posterior margin of S2 and S3 with shorter, posteriorly directed hair, S3–S6 with sparse cover of short, adpressed hair.

Genitalia and associated sterna (figs 94E–H). Gonobase sides slightly flanged basally, gonocoxite with several minute lateral setae, gonostyli with dense cover of branched hair, retrorse lobes glabrous except a few setae basally, well developed, ventral flanges present; S8 median process elongated, broadly rounded with setae apically, S7 median process rounded, glabrous.

Distribution (fig. 94D). Southern areas of the Eyrean province, although there are a few records from southeastern and northwestern Queensland, central New South Wales and a single record from the south central Northern Territory.

Floral Forage Record. Families visited=6. Catch total=43; Loranthaceae (1 catch), Myoporaceae (5), Myrtaceae (32), Pittosporaceae (1), Sapindaceae (3), Sterculiaceae (1). Genera visited=10: *Angophora* (1), *Atalaya* (3), *Brachychiton* (1), *Eremophila* (4), *Eucalyptus* (27), *Leptospermum* (1), *Lysiana* (1), *Melaleuca* (3), *Myoporum* (1), *Pittosporum* (1).

Flight Phenology.

16	6	5	3	2	0	0	1	2	8	13	4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum gunbowerense is a strikingly beautiful species that is easily recognised by its colour patterns. However, these patterns are variable between specimens from eastern and western states. Females in the eastern states have a darker metasoma and the amber marking on the clypeus is reduced. The metasoma of some specimens from Western Australia is almost entirely light red-brown with the basal half of the clypeus amber. Males show a clinal variation with eastern males larger than those in the west. Examination of male genitalia has confirmed conspecificity. Two female specimens from Western Australia have numerous hypopial mites on the dorsal surface of the metasoma and mesoscutum. A few male specimens show macrocephaly through enlargement of the genae, mandibles and clypeus. In these specimens, the inner orbits diverge rather than converge.

Lasioglossum (Chilalictus) gynochilum Michener

Figures 23F, 95A–H

Lasioglossum (*Chilalictus*) *gynochilum* Michener, 1965: 314–315.

Material examined. Holotype. ♀, Queensland, Helidon (27°33′S, 152°08′E), 20 Oct 1958, C.D. Michener, on flowers of *Wahlenbergia* (ANIC).

Other specimens examined (60♀♀, 85♂♂). Queensland: Inglewood, Goondiwindi, Cunninghams Gap, Moonie, Helidon, Bunya Mts Nat. Pk, Roma.

New South Wales and Australian Capital Territory: Canberra, Mt Wilson, Parkes, Muswellbrook, Scone, Trangie, Coonabarabran, Armidale.

Victoria: Strathmore, Quantong, Rushworth.

Diagnosis. Like *L. cephalochilum*. Both sexes black. Female with frons punctate, punctures aligned forming striae, pronotal dorsolateral angles acute, mesoscutum dull, densely punctate except mesially openly to closely punctate, with a dull sheen and openly to closely punctate, dorsal surface of propodeum ruguloso-striolate, defined weakly by posterolateral carinae set well below dorsal level, mesoventral area with hair branched on anterior surface only. Male with antennae moderately short (FL 1.1 × UID), AS4:AS2+3=0.4, mesoventral area with two small, well separated processes, processes broad in side view, forming an obtuse keel ventrally, sternal vestiture weak, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 5.00–5.62 mm ($\bar{x}$=5.34 mm, SD=0.21, n=10), head width 1.57–1.67 mm (n=10), forewing length 1.41–1.53 mm ($\bar{x}$=1.46 mm, SD=0.05, n=10). Relative dimensions: HW 100, HL 82–83, UID 67–68, LID 54–56, AOD 19-20, IAD 13–14, OAD 27–28, IOD 19–20, OOD 20–21, CL 19–20, GW 17–18, EW 27–28, SL 36–37, FL 59–60.

Structure. Head broad, inner orbits converging below, median frontal carina extends to median ocellus, anterior half of carina weak, eyes with moderate cover of short setae. Scape just reaching anterior margin of median ocellus. Clypeus short (CL 0.35 × LID), convex, basally with dull sheen, coarsely roughened with large, deeply impressed punctures and punctures joined to form grooves, posteriorly dull with fine, transverse lineolation, closely punctate, supraclypeal area weakly projected, dull, closely punctate. Frons (fig. 95A) punctate above antennal bases, punctures aligned forming striae,

sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 95B) median basal area raised, coarsely nodulated, anterior margin rounded mesially, distal process not widest at base, distally flanged, median keel extends to distal margin, lateral ridges coarsely serrate, extend to margin, distal margin setae sparse, distal setae originate submarginally, weakly notched on either side of median keel, lateral teeth large, distally hooked. Pronotum dorsolateral angles acute, well projected. Mesoscutum (fig. 95C) anterior margin rounded, punctation moderately coarse, surface dull, anteriorly impunctate, remainder densely punctate except two small mesial areas with dull sheen and openly to closely punctate. Scutellum 1.2 × dorsal surface of propodeum, surface dull, densely punctate except closely punctate mesially. Dorsal surface of propodeum (fig. 95C) defined weakly by posterolateral carinae set well below dorsal level, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture weak, rugulosostriolate on anterior half only, lateral with a few striae, remainder micro-alveolate. T1 densely punctate. Mesepisternum and metepisternum smooth to finely roughened, a few striate on upper portion only. BP rounded.

Colour. Head and mesosoma black, metasoma brown, mandibles red-brown apically, antennal flagellum light brown underneath, propodeum suffused with brown, legs light brown.

Vestiture. Body sparse, with short, simple and a few long, erect hairs, paraocular area with some short, adpressed plumose hair, mesoscutum with short, semi-adpressed simple and erect, minutely branched hair, mesoventral area with hair branched on anterior surface only, metasomal tomentum laterally on T2, across T3 and T4.

Description of male. Body length 4.47–5.00 mm ($\bar{x}$=4.66 mm, SD=0.18, n=10), head width 1.41–1.50 mm (n=10), forewing length 1.18–1.34 mm ($\bar{x}$=1.29 mm, SD=0.05, n=10). Relative dimensions: HW 100, HL 83–85, UID 67–70, LID 50–52, AOD 19–20, IAD 13–14, OAD 26–27, IOD 20–22, OOD 21–22, CL 19–20, GW 17–18, EW 29–30; ML 36–38, SL 30–31, FL 75–77.

Structure. Head broad, eyes converging below, with a moderate cover of short setae, clypeus flat to weakly convex, shining, closely punctate with small rounded punctures, surface entirely black except posteriorly suffused with brown in some specimens, supraclypeal area flat, shining, sparsely punctate. Antennae moderately short (FL 1.1 × UID), AS4:AS2+3=0.4. Remainder of body similar to female except frons distinctly punctate, dorsolateral angles of pronotum obtuse to rounded, well projected, mesoscutum shining, similar punctation to female except mesially openly punctate, scutellum shining, openly punctate, propodeum dorsal carinae absent, sculpture similar except mainly striolate with small mesial ruguloso-striolate area, mesoventral area near mid coxae with two small, broadly rounded, well separated processes, in side view, forming an obtuse keel ventrally (fig. 23F); forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse; frons, paraocular areas, and supraclypeal area with short, adpressed, plumose hair forming a mat, clypeus with moderate hair cover but not forming a mat, mesoscutum with some short, simple adpressed and erect, minutely branched hair, mesoventral area with short, adpressed, minutely hair lateral tomentum on T2 only; sternal vestiture weak, S2–S5 with sparse, erect, minutely branched hair, S6 with adpressed simple hair.

Genitalia and associated sterna (figs 95E–H). Gonobase sides slightly flanged basally, gonocoxite with conspicuous ventral and lateral setae, gonostyli long, densely setose on upper surface only, retrorse lobes setose, fused to gonocoxite, except for small apical section, outline of lobes visible, ventral flanges absent; S8 median process elongate, with simple setae apically, S7 median process broadly rounded, with single seta.

Distribution (fig. 95D). Eastern zone of the Bassian province with mainly inland rather than coastal habitats.

Floral Forage Record. Families visited=2. Catch total=12; Campanulaceae (11 catches), Myrtaceae (1). Genera visited=2; *Eucalyptus* (1), *Wahlenbergia* (11).

Flight Phenology.

4	1	1	2	0	0	0	0	3	6	4	4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. One male specimen has numerous hypopial nymphal mites underneath the fore coxae and on the genae. The black clypeus on the male as well as the reduced gonocoxal retrorse lobes fused to the gonocoxite are unusual characters for the subgenus. *Wahlenbergia* appears to be the preferred forage plant.

Lasioglossum (Chilalictus) hamatum sp. nov.

Figures 96A–E

Material examined Holotype. ♂, Northern Territory, 14 km NW of Cape Crawford (16°34′S, 135°41′E), 6 Nov 1975, JCC, caught in malaise trap (ANIC).

Paratype. 1♂, Western Australia, Lone Dingo, Mitchell Plateau (14°35′S, 125°45′E), 9–19 May 1983, IDN & JCC (ANIC).

Diagnosis. Most like *L. uncinatum*. Male with head and mesosoma black, metasoma brown, antennae short (FL 1.1 × UID), AS4:AS2+3=0.5, mesoventral area with elongate, posteriorly directed, apically hooked processes, S2 with long, erect, plumose hair, curved apically, S3 with similar shorter hair, forewings with 2nd r-m weaker than 1st r-m.

Description of male (female unknown). Body length 4.16–4.62 mm (n=2), head width 1.36–1.50 mm (n=2), forewing length 1.01–1.18 mm (n=2). Relative dimensions: HW 100, HL 88–89, UID 68–70, LID 54–55, AOD 16–17, IAD 15–16, OAD 26–27, IOD 19–20, OOD 19–20, CL 19–20, GW 17–18, EW 25–26; ML 34–36, SL 27–28, FL 72–76.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Antennae short (FL 1.1 × UID), AS4: AS2+3=0.5. Scape not reaching median ocellus. Clypeus convex basally, surface highly polished, anteriorly impunctate, pale yellow, posterior half closely punctate with large, deeply impressed punctures, supraclypeal area slightly raised mesially, highly polished, sparsely to openly punctate with small, shallow, rounded punctures. Frons striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Pronotum dorsolaterally rounded, well projected. Mesoscutum anterior margin with rounded mesial projection, surface shining, punctation moderately coarse, anteriorly with fine transverse lines, impunctate, mesially and in parapsidal areas closely to densely punctate; mesoventral area with elongate, posteriorly directed, apically hooked processes (cf. fig. 24D), processes well separated by distance greater than IAD. Scutellum 1.9 × longer than dorsal surface of propodeum, surface shining, sparsely to openly punctate. Dorsal surface of propodeum not defined by carinae, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture striolate with a few interconnectives mesially, sculpture not reaching dorsal rim, rim with a dull sheen, gently rounded to vertical surface. Metasomal T1 closely punctate. Mesepisternum and metepisternum finely striate. Forewings with 2nd r-m weaker than 1st r-m; BP narrowly rounded.

Colour. Head and mesosoma black, metasoma brown except clypeus as noted, mandibles pale yellow except red-brown apically, antennal flagellum brown underneath, legs brown except tarsi light red-brown.

Vestiture. Frons, paraocular areas with short, adpressed, plumose hair forming a mat, mesoscutum with sparse cover of short, erect, minutely branched hair, mesepisternum with some long, branched hair, weak metasomal tomentum laterally on T2 and T3; S2 with long, erect, plumose hair, curved apically, S3 with similar shorter hair, not so curved though posteriorly directed, S4–S6 almost hair, a few simple hairs.

Genitalia and associated sterna (figs 96B–E). Gonobase sides slightly narrowed basally, gonocoxite with lateral setae, dorsal surface striate, gonostyli long, apically flanged with simple setae on dorsal surface, inner surface with several thickened spines, each spine divided apically into a rosette of spines, retrorse lobes setose, moderately well developed, ventral flanges absent, penis valves dorsoapically angular; S8 median process short, apically acute with a keel, glabrous, S7 median process rounded, glabrous.

Distribution (fig. 96A). Two localities in northern Australia; one in the Northern Territory, the other in northern Western Australia.

Floral Forage Record. None available.

Flight Phenology.

0	0	0	0	1	0	0	0	0	0	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum hamatum and *L. uncinatum* are described to fully illustrate the synapomorphy of the apical hooked shape on the mesoventral processes and the distribution of species with such processes. Three species are known to possess such processes, the two noted above and *L. carpobrotus*. They are found in widely separated localities (*L. hamatum* in northern Western Australia, *L. uncinatum* in central coastal Queensland and *L. carpobrotum* in central South Australia). Unfortunately, the female and forage plant are known only for *L. carpobrotum*.

Etymology. The epithet *hamatum* means "with

hooks" and refers to the apically hooked mesoventral processes.

Lasioglossum (Chilalictus) hapsidum sp. nov.

Figures 97A–H

Material examined Holotype. ♀, Western Australia, 30–35 km E of Esperance (33°51′S, 122°18′E), 1 Nov 1989, KLW, on *Melaleuca uncinata* (NMV T-15588, apical margins of forewings frayed.)

Paratypes (32♀,1♂). Western Australia: 1♀, Kings Park (31°58′S, 115°50′E), 26 Aug 1947, B. Given (NMV T-15589); 3♀, Swanbourne (31°59′S, 115°46′E), (WAM: 40-1205, 40-1206, 46-1603); 2♀, Cottesloe (31°59′S, 115°45′E), (WAM: 33-2096, 36-3400); 4♀, Rottnest (32°00′S, 115°30′E), (WAM: 34-3848, 38-2395, 38-2396, 38-2613); 1♀, Bunbury (33°20′S, 115°38′E), 4 Nov 1947, A.B (NMV T-15590); 1♂, 1.5 km S of Yallingup (33°39′S, 115°02′E), 12–13 Nov 1986, TFH, in *Banksia* cone on ground (WAM 90/71); 1♀, Yallingup (33°39′S, 115°01′E), 22 Dec 1966, EME, on Xmas bush (UQIC); 16♀, same data as holotype (NMV T-15591–15606); 2♀, Augusta (34°19′S, 115°09′E), 11 Oct 1980, S.M. Slack-Smith & M.C. Ellis, burrowing in ground (WAM: 87/600–601); 1♀, Cape Leeuwin, Augusta (34°22′S, 115°08′E), 19 Nov 1975, K.A. Spencer (WAM: 87/549); 1♀, 10 km SW of Albany (35°02′S, 117°50′E), 7 Nov 1989, KLW, on *Lysinema ciliatum* (NMV T-15607).

Diagnosis. Most like *L. asperithorax*. Both sexes with body black. Female with frons finely striate, mesoscutum densely punctate, punctures contiguous with slightly raised ridges, dorsal surface of propodeum striate except small mesial area ruguloso-striolate, defined by lateral carinae, posterolateral corners flanged, BP bluntly angular apically. Male with antennae moderately long, S2 and S3 with long plumose hair across sternite, S4 and S5 with distinct lateral tufts, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.70–8.08 mm ($\bar{x}$=7.47 mm, SD=0.48, n=10), head width 2.19–2.39 mm (n=10), forewing length 2.00–2.28 mm ($\bar{x}$=2.13 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 78–80, UID 56–57, LID 53–54, AOD 19–22, IAD 9–10, OAD 24–25, IOD 16–17, OOD 13–14, CL 19–20, GW 15–17, EW 24–25, SL 40–41, FL 65–67.

Structure. Head broad, inner orbits weakly converging below, median frontal carina not reaching median ocellus, eyes almost bare, few minute setae. Scape reaching anterior margin of lateral ocelli. Clypeus short (CL 0.37 × LID), convex more so anteriorly, surface shining except anterior margin dull, closely to densely punctate anteriorly with deeply impressed punctures, posteriorly closely punctate with small shallow punctures, supraclypeal area protruded, dull, closely to densely punctate. Frons (fig. 97A) finely striate, though with interconnective giving a somewhat reticulate appearance, above antennal bases, sculpture laterally continues almost to inner margins of eyes, extends vertically almost to posterior margin of lateral ocelli. Labrum (fig. 97B) basal median area slightly raised, surface smooth to weakly ridged, anterior margin bluntly obtuse mesially, distal process not tapered, widest at base, median keel spatulate distally, extends beyond setose distal margin, lateral ridges absent, lateral teeth large, distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 97C) anterior margin rounded, punctation conspicuously coarse, surface dull, anteriorly with fine transverse lines, remainder densely punctate, punctures contiguous with slightly raised ridges, sculpture along midline with finer pattern than laterally. Scutellum 1.3 × longer than dorsal surface of propodeum, surface projected, densely punctate either side of midline small area shining and closely punctate. Dorsal surface of propodeum (fig. 97C) defined by lateral carinae set just below dorsal level, posterolateral corners flanged, posterovertical carinae not reaching half way to dorsal level, dorsal sculpture striolate except small mesial area ruguloso-striolate, sculpture reaches rim, dorsal rim bluntly angular. T1 densely punctate. Mesepisternum striate on upper half only, remainder and metepisternum smooth. BP bluntly obtuse apically.

Colour. Body black except mandibles dark red-brown apically, antennae and metasomal posterior marginal areas brown, legs black with faint tinge of brown.

Vestiture. Body sparse, frons and paraocular areas with some long branched hair, clypeus with few simple hair, mesoscutum with short, erect branched hair, weak lateral tomentum on T2–T4.

Description of male. Body length 7.85mm, head width 2.39mm, forewing length 2.16mm. Relative dimensions: HW 100, HL 81, UID 63, LID 47, AOD 17, IAD 14, OAD 26, IOD 20, OOD 16, CL 20, GW 17, EW 27; ML 35, SL 27, FL 117.

Structure. Head broad, inner margins converging below, eyes with few minute setae, scape not reaching median ocellus, clypeus weakly convex, shining, closely punctate, basal half pale white/yellow, supraclypeal area weakly bulbous,

shining mesially, sculpture similar to female. Antennae moderately long (FL 1.86 × UID), AS4:AS2+3=1. Remainder similar to female except mesoscutum densely punctate, mesial punctures with small smooth shining interspaces, dorsal surface of propodeum not defined by lateral carinae, ruguloso-striolate sculpture restricted to basal margin of dorsal surface only, colour similar to female, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, lower paraocular area with small mat of adpressed plumose hair, remainder of face with erect plumose hair not forming a mat, weak lateral tomentum on T2; S2 and S3 with long plumose hair across sternite, S4 and S5 with distinct lateral tufts, though short hair present mesially.

Genitalia and associated sterna (figs 97E–H). Gonobase slightly flanged basally, gonocoxite setose on apical inner margin, gonostyli long with a few simple hair apically, retrorse lobes weakly developed, ventral flanges absent, lobes setose; S8 median process truncate apically with short simple setae, S7 median process rounded, glabrous.

Distribution (fig. 97D) Coastal regions of southwestern Western Australia.

Etymology. The epithet *hapsidum* refers to the "mesh-like" sculpture on the mesoscutum.

Floral Forage Record. Families visited=4. Catch total=4; Epacridaceae (1 catch), Loranthaceae (1), Myrtaceae (1), Proteaceae (1). Genera visited=4; *Banksia* (1), *Lysinema* R.Br. (1), *Melaleuca* (1), *Nuytsia* (1).

Flight Phenology.

0	0	0	0	0	0	0	1	0	1	5	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Lasioglossum (Chilalictus) helichrysi (Cockerell)

Figures 18B, 98A–H

Halictus helichrysi Cockerell, 1914a: 515–516.
Lasioglossum (*Chilalictus*) *helichrysi*. — Michener, 1965: 176.

Material examined. Holotype. ♀, Queensland, Tambourine (sic Tamborine) Mountain (27°53′S, 153°08′E), 27 Oct 1912, H. Hacker, at flowers of *Helichrysum bracteatum*, T-4123 (QM, missing last tarsal segment on left foreleg, metasoma detached and glued to pith. Note that a single ♀ specimen with similar label data, lodged in USNM, is not considered to be part of the type series as the original description refers only to specimens lodged in the QM.)

Other specimens examined (16 ♀♀, 7 ♂♂). Queensland: Stanthorpe, Condamine, Eulo, Cunnamulla, Tamborine Mt, St. George, Jimboomba, Oakey, Taroom, Eidsvold.

New South Wales and Australian Capital Territory: Nadgee Nat. Reserve, Dubbo, Conargo, Young, Narrabri, Covelly, Blue Mts, Orange, Euabalong, Menindee Lakes, Coonabarabran, Wilcania, Port Macquarie, Cobar, Mootwingee, Narrabri, Guyra, Arrawarra, Glen Innes, Wallangarra, Lismore, Amosfield, Brunswick Heads.

Victoria: Apollo Bay, Cape Nelson, Melbourne, Echuca.

Tasmania: Hobart, Strahan. South Australia: Athelstone, Ngarkat Conservation Park, Ooldea.

Northern Territory: Alice Springs.

Diagnosis. Most like *L. pulvitectum*. Both sexes black. Female with frons punctate, mesoscutum densely punctate, dorsal surface of propodeum ruguloso-striolate, not defined by carinae, BP acutely pointed apically. Male with antennae moderately long, AS4:AS2+3=1, sternal vestiture sparse forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.31–7.32 mm ($\bar{x}$=6.86 mm, SD=0.32, n=10), head width 1.95–2.12 mm (n=10), forewing length 1.60–1.79 mm ($\bar{x}$=1.71 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 79–82, UID 61–62, LID 56–57, AOD 20–21, IAD 10–11, OAD 26–28, IOD 18–19, OOD 17–18, CL 19–20, GW 19–20, EW 23–24, SL 37–30, FL 63–65.

Structure. Head broad though distinctly triangular, inner orbits converging below, median frontal carina not reaching median ocellus, eyes with sparse cover of minute setae. Scape reaches at least posterior margin of median ocellus. Clypeus short (CL 0.35 × LID), convex basally, surface smooth and polished, closely punctate with large, deeply impressed punctures, exeept a few punctures on basal margin irregular in shape, supraclypeal area well projected, shining, openly to closely punctate. Frons (fig. 98A) punctate above antennal bases punctate, sculpture laterally weakens to almost smooth along inner orbits, extends vertically to at least anterior margin of lateral ocelli. Labrum (fig. 98B) median basal area raised, weakly nodulated and ridged, anterior margin rounded mesially, distal process small, not widest at base, weakly flanged distally, median keel spatulate, extends beyond setose distal margin, lateral ridges absent, a few small, straight lateral teeth. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 98C) anterior margin

rounded, punctation conspicuously coarse, anteriorly impunctate, densely punctate along midline and parapsidal areas, midline punctures smaller than other punctures, openly to densely punctate mesially. Scutellum 1.4 × longer than dorsal surface of propodeum, surface shining, openly to closely punctate. Dorsal surface of propodeum (fig. 98C) not defined by carinae, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture ruguloso-striolate with a few striae laterally, sculpture reaches rim, rim rounded. T1 densely punctate. Mesepisternum and metepisternum striate. BP acutely pointed apically (fig. 18B).

Colour. Body black except mandibles red-brown apically, antennal flagellum brown underneath, posterior margin of tergites light brown, legs brown with tibiae and tarsi light brown in some specimens.

Vestiture. Body sparse, some semi-adpressed to erect long, plumose hair on frons and paraocular areas, mesoscutum with short, erect sparse hair, metanotum with small amount of hair band on anterior margin, metasomal tomentum weakly present on T2 and T3.

Description of male. Body length 5.70–6.39 mm ($\bar{x}$ = 5.96 mm, SD = 0.22, n = 10), head width 1.79–1.97 mm (n = 10), forewing length 1.48–1.64 mm ($\bar{x}$ = 1.55 mm, SD = 0.05, n = 10). Relative dimensions: HW 100, HL 83–86, UID 62–63, LID 45–46, AOD 14–16, IAD 14–15, OAD 25–27, IOD 17–19, OOD 16–17, CL 21–22, GW 15–17, EW 28–29; ML 38–40, SL 26–27, FL 142–145.

Structure. Head distinctly triangular, inner orbits converging below, eyes a sparse cover of minute setae, scape not reaching median ocellus, clypeus flat with a dull sheen, surface minutely roughened with indistinct punctures, basal half with pale white/yellow marking, supraclypeal area weakly projected, dull and impunctate. Antennae moderately long (FL 2.3 × UID), AS4:AS2+3 = 1. Remainder of body similar to female except mesoscutum dull, except mesially punctures contiguous, dorsal surface of propodeum sculpture not reaching rim mesially; colour similar to female except metasoma brown, legs light brown, in some specimens apical and basal areas of femora light red-brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, lower paraocular areas with some short, adpressed, plumose hair almost forming a mat, remainder of head with short, erect hair, mesoscutum with similar hair, metasomal tomentum weak laterally on T2 and T3; sternal vestiture sparse, S2–S4 with a few erect, minutely branched hairs across sternites, S5 with sparse adpressed hair, S6 with similar hair except forming weak lateral tufts.

Genitalia and associated sterna (figs 98E–H). Gonobase sides slightly flanged basally, gonocoxite without setae, gonostyli with sparse cover of short hair, retrorse lobes setose, well developed, ventral flanges absent; S8 median process apically broadly rounded to truncate, with setae, S7 median process rounded, glabrous.

Distribution (fig. 98D). Eastern zone of the Bassian province, with a few records from central Australia.

Floral Forage Record. Families visited = 6. Catch total = 17; Compositae (2 catches), Fabaceae (2), Myoporaceae (1), Myrtaceae (10), Proteaceae (1), Sapindaceae (1). Genera visited = 11; *Angophora* (1), *Atalaya* (1), *Baeckea* (1), *Eremophila* (1), *Eucalyptus* (1), *Grevillea* (1), *Helichrysum* (1), *Jacksonia* (2), *Leptospermum* (6), *Melaleuca* (1), *Senecio* (1).

Flight Phenology.

7	0	2	1	0	0	0	1	8	15	10	13
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Lasioglossum (Chilalictus) hemichalceum (Cockerell)

Figures 99A–H

Halictus hemichalceus Cockerell, 1923: 239.
Lasioglossum (*Chilalictus*) *hemichalceum*. — Michener, 1965: 176.

Material examined. Holotype. ♀, Queensland, Brisbane (27°28′S, 153°02′E), Sep 1914, H. Hacker, QM Type No. Hy/2743 (QM, missing right hind tarsi.)

Other specimens examined (406♀♀, 64♂♂). Queensland: Stanthorpe, Leyburn, Brisbane, Murphy's Creek, Miles, Landsborough, Mitchell, Gurulmundi, Serpentine Creek, Mundubberra, Kuranda.

New South Wales and Australian Capital Territory: Nadgee Reserve, Jerilderie, Canberra, Bungendore, Lane Cove, Bathurst, Narromine, Mendooran, Camboyne, Mt Kaputar, Woollahra.

Victoria: Lorne, Anglesea, Barwon Heads, Cobboboonee State Forest, Melbourne, Lakes Entrance, Woori Yallock, Taggerty, Castlemaine, Omeo, Euroa, Kiata, Donald.

Tasmania: Hobart, New Town.

South Australia: Mt Gambier, Millicent, Rendelsham, Robe, Naracoorte, Kongal, Kangaroo Island, Meningie, Hartley, Adelaide, Athelstone, Swan Reach, Morgan, Kimba, Lake Gilles Nat. Pk, Poochera, Oodla Wirra, Melrose, Gawler Ranges, Karragullen, Brachina Ck, Arkaroola, Amata.

Western Australia: Albany, Denmark, Walpole, Porongorup Range, Sterling Ranges, Dean Mill, Donnelly River Xing, Pemberton, Karridale, Hamersley Inlet, Broomehill, Katanning, Kojonup, Boyup Brook, Yallingup, Bunbury, Mt Ragged, Wagin, Ravensthorpe, Waroona, Kukerin, Newdegate, Lake Graee, Lake King, Waroona, Kulin, Dwellingup, Peak Charles, Narrogin, Bannister, Norseman, Williams, Perth, Kalamunda, Glen Forrest, Bushmead, Mundaring, York, Hovea, West Midland, Eucla, Kellerberrin, Gingin, Bungalbin Hill, Jurien, Dongara, Weld Range, Giles, Mt Ant, Millstream.

Diagnosis. Most like *L. erythrurum*. Female with head and propodeum black, mesoscutum dull metallic green with copper tinge, metasoma red-brown, some specimens with black mesial area on T1, frons punctate/striate, mesoscutum anterior margin with bilobed mesial projection, surface dull, densely punctate, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae, fore tibial spur fan shaped. Male with body black, antennae long (FL 2.2 × UID), AS4:AS2+3=1, S2–S4 with posteriorly directed, plumose hair across sternites, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.70–5.39 mm ($\bar{x}$=5.04 mm, SD=0.23, n=10), head width 1.48–1.67 mm (n=10), forewing length 1.22–1.43 mm ($\bar{x}$=1.32 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 85–87, UID 60–62, LID 58–61, AOD 19–21, IAD 10–12, OAD 31–33, IOD 23–24, OOD 15–17, CL 19–20, GW 18–20, EW 24–26, SL 36–38, FL 71–73.

Structure. Head broadly triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.33 × LID), convex, more so along basal margin and laterally, surface smooth and shining except anterior margin dull covered with fine reticulate pattern, densely punctate mesially with deeply impressed punctures, laterally sparsely punctate with slightly smaller punctures, anterior margin openly punctate with small, rounded, shallow punctures, supraclypeal area raised, with a dull sheen, openly punctate with small, shallow punctures. Frons (fig. 99A) punctate, though punctures aligned forming striate pattern above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 99B) median basal area raised forming V-shaped tubercle, anterior margin rounded, margin raised forming lip, distal process triangular, widest at base, median keel distally spatulate, extends to margin, lateral ridges large and broad, dorsally smooth, basally recurved towards median keel, setae not present across distal margin, lateral teeth small, straight. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 99C) anterior margin with bilobed mesial projection, punctation coarse, surface dull, anteriorly openly to closely punctate, remainder densely punctate, mesially punctures with interspaces present, laterad of parapsidal lines and in parapsidal areas punctures contiguous. Scutellum length equal to length of dorsal surface of propodeum, surface dull except either side of midline with dull sheen, midline and around margins densely punctate, laterally openly to closely punctate. Dorsal surface of propodeum (fig. 99C) defined by posterolateral angular carinae set well below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate with a few striae laterally, sculpture almost reaches dorsal rim mesially, not laterally, dorsal rim with a dull sheen, gently rounded. Metasomal T1 densely punctate except posterior marginal area impunctate. Mesepisternum lower half shining though minutely roughened, upper half striate, metepisternum minutely roughened. Fore tibial spur fan shaped; BP rounded.

Colour. Head and propodeum black, mesoscutum dull metallic green with copper tinge, metasoma red-brown, some specimens (including holotype with black mesial area on T1), legs dark brown to black except fore tibiae and tarsi suffused with red-brown.

Vestiture. Frons and paraocular areas with dense cover of short, semi-adpressed, minutely branched hair, hair not forming a mat, clypeus and supraclypeal area with a few, erect, long hairs, mesoscutum with conspicuous cover of short, semi-erect hair, hair mesially directed laterally, lateral hair directed mesially, scutellum with similar shorter hair, metasomal tomentum absent.

Description of male. Body length 3.85–4.77 mm ($\bar{x}$=4.14 mm, SD=0.28, n=10), head width 1.27–1.48 mm (n=10), forewing length 0.94–1.20 mm ($\bar{x}$=1.05 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 81–83, UID 61–62, LID 45–47, AOD 14–16, IAD 15–16, OAD 28–29, IOD 24–26, OOD 16–17, CL 18–19, GW 16–18, EW 30–32; ML 36–38, SL 24–26, FL 135–138.

Structure. Head broadly triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute hair, clypeus convex, so along

ventral margin, surface smooth and shining, almost impunctate though with several minute punctures mesially, basal half dull white/yellow, supraclypeal area smooth and shining. Antennae moderately long (FL 2.2 × UID), AS4:AS2+3=1. Remainder as female, but with frons striate without punctate as in female, pronotum dorsolaterally rounded, weakly projected, mesoscutum anterior margin with bilobed, weak mesial projection, surface smooth and shining, sparsely to openly punctate with minute punctures, scutellum smooth, polished, impunctate, dorsal surface of propodeum not defined by carinae, sculpture weakly ruguloso-striolate, extending about half way to dorsal rim, rim smooth and shining; colour- body black, mandibles and clypeus as noted dull white yellow, antennal flagellum light red-brown underneath, legs dark brown with fore, and mid tibiae and all tarsi light red-brown, hind tibiae suffused with light red-brown; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower paraocular areas with adpressed, plumose hair, dense cover not forming a mat, mesoscutum with sparse hair cover, metasomal tomentum absent; S2–S4 with moderate cover of posteriorly directed, plumose hair across sternites.

Genitalia and associated sterna (figs 99E–H). Gonobase sides slightly narrowed basally, gonocoxite without setae, gonostyli long, narrow, with moderate cover of short hair, retrorse lobes almost glabrous, well developed, ventral flanges present; S8 median process broadly rounded and setose apically, S7 median process apically rounded, glabrous.

Distribution (fig. 99D). Bassian province, as well as North Queensland, central Australia and sporadically across the Nullarbor Plain.

Floral Forage Record. Families visited=10. Catch total=101; Amaranthaceae (1 catch), Boraginaceae (1), Compositae (2), Fabaceae (5), Goodeniaceae (1), Myoporaceae (3), Myrtaceae (75), Orchidaceae (1), Pittosporaceae (3), Proteaceae (9). Genera visited=25; *Acacia* (3), *Angophora* (1), *Arctotheca* (1), *Banksia* (2), *Bursaria* (3), *Calothamnus* Labill. (1), *Calytrix* (1), *Cassia* (1), *Dryandra* R.Br. (1), *Eremophila* (2), *Eucalyptus* (55), *Grevillea* (2), *Hakea* (2), *Isopogon* (2), *Kunzea* (1), *Lechenaultia* (1), *Melaleuca* (14), *Myoporum* (1), *Prasophyllum* (1), *Ptilotus* (1), *Pultenaea* (1), *Senecio* (1), *Syzygium* (1), *Trichodesma* (1), *Tristaniopsis* (1).

Flight Phenology.

23	21	4	0	3	0	0	4	11	22	34	25
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum hemichalceum is a member of the "erythrurum" species-complex in which species are not readily distinguished. Females often display a wide range of intraspecific variation, though no differentiation between males was noted. Electrophoretic and DNA analysis may assist in resolving the taxonomic status of these species.

The distribution of *L. hemichalceum* extends from Queensland to southwestern Australia. There are marked differences between female mesoscutum morphology and vestiture between populations in the eastern states and those in Western Australia. The female characters noted in the my redescription are typical of the type (from Brisbane) and specimens from the eastern states only. Specimens from South Australia and Western Australia, have open to close punctation and sparse vestiture on the mesoscutum (cf. specimens from eastern Australia). On Western Australian specimens, the anterior margin of the mesoscutum is bilobed to form a weak mesial projection mesially, though this projection is not as prominent as occurs on eastern specimens. Conspecificity was established through comparative examination of male genitalia. Males show marked degrees of macrocephaly, including the unique "Type B" macrocephalic male (large head and body, reduced wings) discussed by several authors (Houston, 1970, 1991, Kukuk & Schwarz 1987, all of whom incorrectly identified the species as *L. erythrurum*.)

Lasioglossum (Chilalictus) humei (Cockerell)

Figures 100A–H

Halictus humei Cockerell, 1905b: 303–304.
Lasioglossum (*Chilalictus*) *humei*. — Michener, 1965: 176.

Material examined. Holotype, ♀, Australia, 67-42, BM Type Hym 17.a.961 (BMNH, missing last seven and three flagellar segments from the left and right antennae respectively, right fore tarsus missing.)

Other specimens examined (63♀♀, 13♂♂). Queensland: Stanthorpe, Leyburn.

New South Wales and Australian Capital Territory: Nadgee Reserve, Kiandra, Brindabella Ra., Queanbeyan, Canberra, Collector, Goulburn, Bathurst, Orange, Mendooran, Armidale, Glen Innes, Deepwater.

Victoria: Nelson, Broadmeadows, Omeo.

Diagnosis. Most like *L. demicapillum*. Both sexes black. Female with frons striate, mesoscu-

tum mesially closely to densely punctate, laterad of parapsidal lines and in parapsidal areas densely punctate, mesoventral area with hair branched on anterior side only, dorsal surface of propodeum ruguloso-striolate on basal half only, defined weakly by posterolateral carinae set just below dorsal level. Male with clypeus black, antennae short (FL 1.2 × UID), AS4:AS2+3=0.4, mesoventral area with sparse hair cover, S2–S4 with short, plumose hair across sternites, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.31–5.47 mm ($\bar{x}$=4.94 mm, SD=0.42, n=10), head width 1.46–1.58 mm (n=10), forewing length 1.20-1.41 mm ($\bar{x}$=1.30 mm, SD=0.06, n=10). Relative dimensions: HW 100, HL 78–79, UID 65–66, LID 53–54, AOD 19–20, IAD 12–14, OAD 26–27, IOD 17–18, OOD 20–21, CL 20–21, GW 18–19, EW 25–28, SL 33–35, FL 60–62.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes appear bare except a few minute setae present. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.38 × LID), convex, surface dull, appears impunctate though sparsely punctate with small, shallow punctures, supraclypeal area moderately projected, openly punctate with punctures similar to clypeus. Frons (fig. 100A) striate, with striae meeting along median frontal carina above antennal bases, sculpture laterally weakens to weakly punctate along inner orbits, extends vertically to posterior margin of median ocellus. Labrum (fig. 100B) median basal area conspicuously raised, coarsely roughened with irregular ridges, lateral areas weakly recessed, distal process not tapered, widest at base, median keel weakly spatulate, extends to distal margin, lateral ridges absent, setae not present across margin, distal setae originate submarginally, lateral teeth large, distally hooked. Pronotum dorsolaterally rounded, moderately projected. Mesoscutum (fig. 100C) anterior margin rounded, punctation fine, anteriorly impunctate, mesially closely to densely punctate, laterad of parapsidal lines and in parapsidal areas densely punctate, interspaces between punctures in parapsidal areas distinctly less than mesially. Scutellum 1.3 × longer than dorsal surface of propodeum, surface dull, densely punctate. Dorsal surface of propodeum (fig. 100C) defined weakly by posterolateral carinae set just below dorsal level, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture finely ruguloso-striolate on basal half only, a few striae laterally, entire surface micro-alveolate, dorsal rim rounded. T1 densely punctate. Mesepisternum and metepisternum smooth except finely striate on upper portion only. BP rounded.

Colour. Body black except mandibles red-brown apically, antennal flagellum brown underneath, metasomal posterior marginal areas suffused with brown, legs brown.

Vestiture. Body sparse, frons with short, simple hair and a few long, minutely branched hairs, paraocular areas similar but hairs more numerous, mesoscutum hair similar but not as long, mesoventral area with hair branched on anterior side only (cf. figs 25C, D), metasomal tomentum laterally on T2, across T2–T4, S2 and S3 with plumose hair.

Description of male. Body length 4.24–4.62 mm ($\bar{x}$=4.41 mm, SD=0.15, n=10), head width 1.41–1.46 mm (n=10), forewing length 1.20–1.25 mm ($\bar{x}$=1.22 mm, SD=0.02, n=10). Relative dimensions: HW 100, HL 80–82, UID 63–64, LID 48–50, AOD 17–18, IAD 15–16, OAD 26–27, IOD 19–20, OOD 21–22, CL 19–20, GW 16–17, EW 30–31; ML 38–39, SL 30–31, FL 76–78.

Structure. Head broad, inner orbits converging below, eyes with a few minute setae, scape not reaching median ocellus, clypeus convex, basally with a dull sheen, coarsely roughened with shallow, longitudinal grooves, entirely black, anteriorly dull, with fine transverse lineolation, supraclypeal area well projected, with a dull sheen, sparsely punctate. Antennae moderately short (FL 1.2 × UID), AS4:AS2+3=0.4. Remainder of body similar to female except pronotal dorsolateral angles barely projected, mesoscutum with a dull sheen, closely punctate, scutellum shining, sparsely to openly punctate; colour similar to female; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body with moderate cover, frons and paraocular areas with erect, and adpressed, branched hair, not forming a mat, mesoscutum and mesepisternum with conspicuous cover of long, erect, branched hair, mesoventral area with sparse cover of short, adpressed simple hair, metasomal lateral tomentum on T2 and T3; S2–S4 with short, erect, plumose hair across sternites, hair slightly longer on lateral margins though not forming lateral tufts, S5 and S6 with sparse, adpressed simple and branched hair.

Genitalia and associated sterna (figs 100E–H). Gonobase large, sides slightly flanged basally, gonocoxite without setae, retrorse lobes weakly

setose, moderately developed, ventral flanges absent, gonostyli long, with simple setae; S8 median process short, obtuse, with a few lateral setae, S7 median process rounded, glabrous.

Distribution (fig. 100D). Eastern zone of the Bassian province with a preference for high altitude rather than coastal habitats.

Floral Forage Record. Families visited=3. Catch total=11; Campanulaceae (8 catches), Goodeniaceae (1), Myrtaceae (2). Genera visited=4; *Goodenia* (1), *Kunzea* (1), *Leptospermum* (1), *Wahlenbergia* (8).

Flight Phenology.

11	2	2	0	0	0	0	0	0	1	7	2
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. There may be an association between a mesoventral area hair structure of females, which is branched on anterior side of hair shaft only, and the anther position and pollen grain size of *Wahlenbergia*. A simple hair structure is usual for the mesoventral area. Only the species-group of bees that forage on *Wahlenbergia* flowers have modified hair structures. I have observed these bees walk down inside the elongate corolla tube of the *Wahlenbergia* flower, thus pollen collection from these flowers may occur through use of the modified mesoventral area hairs rather than by use of the forelegs.

Lasioglossum (Chilalictus) imitans (Cockerell)

Figures 11D, 101A–H

Halictus imitans Cockerell, 1914a: 516.
Halictus repertus Cockerell, 1914a: 521. syn. nov.
Halictus isthmalis Cockerell, 1914c: 367. syn. nov.
Halictus confusellus Cockerell, 1916b: 374. syn. nov.
Lasioglossum (*Chilalictus*) *imitans*. — Michener, 1965: 176.
Lasioglossum (*Chilalictus*) *repertum*. — Michener, 1965: 177.
Lasioglossum (*Chilalictus*) *isthmale*. — Michener, 1965: 176.
Lasioglossum (*Chilalictus*) *confusellum*. — Michener, 1965: 175.

Material examined. Syntype of *imitans*. ♀, Victoria, Feb 1907, C.F. (T.D.A. Cockerell), 1914-352, BM Type Hym 17.a.921 (BMNH, missing left antenna.)

Holotype of *repertus*. ♂, Victoria, near Melbourne (37°49′S, 144°58′E) (Nat. Mus. Victoria). BM Type Hym 17.a.952 (BMNH, genitalia extruded.)

Holotype of *isthmalis*. ♂, Tasmania, Eaglehawk Neck (43°02′S, 147°55′E), 12 Feb–3 Mar 1913, R.E. Turner, BM Type Hym 17.a.929 (BMNH).

Holotype of *confusellus*. ♀, Tasmania, Launceston (41°26′S, 147°08′E), F.M. Littler Coll. 2698, BM Type Hym 17.a.987 (BMNH, glued to card.)

Other specimens examined (53♀♀, 31♂♂). Queensland: Emu Vale, Binna Burra, Lamington Nat. Pk, Bunya Mts.

New South Wales and Australian Capital Territory: Nadgee Reserve, Mt Kosciusko, Mt Gingera, Brindabella Ra., Blue Mts, Barrington Tops.

Victoria: Apollo Bay, Portland, Anglesea, Gorae West, Whisky Flat, Healesville, Dinner Plain, Glen Wills.

Tasmania: Melaleuca, Eaglehawk Neck, Strahan, Campbell Town, Great Lake, Launceston, Marrawah. South Australia: Kangaroo Is.

Western Australia: Karridale.

Diagnosis. Propodeum sculpture unlike any other species. Both sexes with body black. Female with frons reticulate, mesoscutum along midline and parapsidal areas densely punctate, remainder openly to closely punctate, dorsal surface of propodeum defined posteriorly by angular carinae set at dorsal level, sculpture mesially ruguloso-striolate, laterally striate, dorsal rim weakly raised in V-shape. Male with antennae moderately long (FL 2.27 × UID), tibiae, tarsi and pygidial plate light red-brown, S2–S4 with long plumose across sternites, S3 and S4 hair slightly longer laterally; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.01–7.31 mm ($\bar{x}$=6.92 mm, SD=0.36, n=15), head width 1.77–2.12 mm (n=15), forewing length 1.53–1.83 mm ($\bar{x}$=1.75 mm, SD=0.09, n=15). Relative dimensions: HW 100, HL 83–87, UID 63–65, LID 54–56, AOD 20–22, IAD 10–12, OAD 27–30, IOD 17–19, OOD 18–19, CL 20–23, GW 15–18, EW 25–26, SL 38–40, FL 67–69.

Structure. Head wider than long, inner orbits converging below, in specimens with striate frons (syntype of *imitans*) median frontal carina reaches median ocellus, in specimens with reticulate to punctate frons upper portion of median frontal carinae weak to absent, eyes with short sparse setae. Scape reaches lateral ocelli. Clypeus short (CL 0.38 × LID), in dorsal view appears flat, in side view gently convex, shining except transverse lineolation posteriorly, openly punctate, punctures shallowed and rounded, supraclypeal area projecting, shining mesially, closely punctured. Frons reticulate (fig. 101A) or striate (as in syntype of *imitans*) above antennal bases, sculpture extends vertically to anterior margin of lateral ocelli. Labrum (fig. 101B) basal median area raised, sculpture smooth except several small mounds, distal process not tapered, widest at base, median keel extends

beyond setose distal margin, lateral ridges prominent, serrate, extend to distal margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles obtuse to acute, projected. Mesoscutum (fig. 101C) anterior margin with weak rounded mesial projection, punctation moderately coarse, shining except anteriorly dull, along midline and in parapsidal areas densely punctate, remainder openly to closely punctate. Scutellum length equal to dorsal surface propodeum length, shining, densely punctate along midline, remainder openly to closely punctate. Dorsal surface of propodeum (figs 11D, 101C) defined posteriorly by angular carinae set at or just below dorsal level, carinae not meeting mesially, posterovertical carinae reach dorsal carinae, dorsal sculpture mesially rugulose-striolate, laterally striate, dorsal rim weakly raised in V-shape, sculpture reaches rim laterally. Some specimens with T1 open to sparsely punctate on posterior half (as in syntype of *imitans*), some with T1 entirely densely punctate. Mesepisternum and upper half of metepisternum weakly striae, lower half of metepisternum smooth; BP obtuse apically.

Colour. Body black; apical half of mandibles dark red-brown, flagellum light brown underneath, scape, pedicle and all legs dark brown.

Vestiture. Body sparse, face and mesoscutum with erect, minutely branched hair; lateral tomentum on T2 and T3.

Description of male. Body length 5.39–6.70 mm ($\bar{x}$=6.20 mm, SD=0.45, n=10), head width 1.69–1.93 mm (n=10), forewing length 1.50–1.81 mm ($\bar{x}$=1.66 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 89–92, UID 64–66, LID 46–49, AOD 16–17, IAD 12–13, OAD 25–28, IOD 18–21, OOD 18–19, CL 21–23, GW 15–16, EW 30–31, ML 38–39, SL 27–28, FL 145–150.

Structure. Head broad, almost as long as wide, inner orbits converging below, eyes moderately covered with short setae, frons striate; clypeus flat, basal half with white-yellow marking; scape just reaching median ocellus. Antennae moderately long (FL 2.27 × UID), AS4:AS2+3=1. Remainder of sculpture similar to female except dorsal propodeal posterior carinae weakly defined. Colour similar to female except yellow on clypeus, basal half of mandibles amber and tibiae, tarsi and pygidial plate light red-brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Paraocular areas with short plumose adpressed hair almost forming a mat; S2–S4 with long plumose posteriorly directed hair across sternites, S3 and S4 hair slightly longer laterally, though not forming lateral tufts.

Genitalia and associated sterna (figs 101E–H). Gonobase sides weakly flanged basally, gonocoxite setose on apical inner margin, gonostyli with long, branched setae, retrorse lobes setose, well developed, ventral flanges present; S8 median process truncate, glabrous, S7 median process rounded, glabrous.

Distribution (fig. 101D). Eastern zone of the Bassian province, with a single record from south-western Western Australia.

Floral Forage Record. Families visited=7. Catch total=14; Compositae (1 catch), Fabaceae (3), myrtaceae (3), Orchidaceae (1), Pittosporaceae (3), Proteaceae (2), Rutaceae (1). Genera visited=12; *Acacia* (1), *Boronia* (1), *Bossiaea* (1), *Bursaria* (3), *Conospermum* (1), *Eucalyptus* (1), *Leptospermum* (1), *Melaleuca* (1), *Petrophile* Knight (1), *Pultenaea* (1), *Senecio* (1), *Thelymitra* (1).

Flight Phenology.

3	9	2	1	0	0	0	0	2	5	13	3
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Cockerell (1914d) listed two specimens in his description of *H. imitans*, of which I have located only one.

The morphology of the specimens examined suggests that *L. imitans* may in fact represent a species-complex of two species. The two forms are sympatric and only females may be separated, having either, frons striate and T1 sparsely punctate or, frons punctate to reticulate and T1 densely punctate. The type of *imitans* displays the former combination. Two specimens from Mt Kosciusko (BCRI) display an intermediate form having frons reticulate with sparsely punctate T1. Males show neither variation of sculpture nor of genitalia. Since intermediates between the two forms are present and no differences in male genitalia could be found, I have decided not to split *L. imitans* into two species, but rather to record the sculpture differences that occur within members of this species.

One female specimen has a single hypopial nymphal mite on the left mid tibia and another on the tarsus of the same leg.

Lasioglossum (Chilalictus) immaculatum sp. nov.

Figures 102A–H

Material examined. Holotype. ♀, Northern Territory, 30 km S of Alice Springs (24°12′S, 133°52′E), 3 Nov

1974, EME & R.I. Storey, on *Eucalyptus gammophylla* (QM T13908).

Paratypes. 13♀♀, 43♂♂, same data as holotype (UQIC)

Other specimens examined (208♀♀, 137♂♂). Queensland: Windorah, Longreach, Boulia, Mt Isa.

South Australia: Edeowie HS, Roxby Downs, Everard Park Station, Mt Davies, Amata.

Northern Territory: Alice Springs, Amadeus Basin, MacDonnell Ranges, Aileron, Mt Solitaire, Barrow Creek, Ti-Tree, Ooratippra, Wauchope, Tennant Creek, Renner Springs, Elliott, Dunmarra, Borroloola, Daly Waters.

Western Australia: Mulline, Neale Junction, Laverton, Warburton, Irrunytju, Giles, Charles Knob, Mt Ant, Onslow, Windy Corner, Newman, Roy Hill, De Grey River, South Hedland, Port Hedland, Sandfire Roadhouse, Broome, Derby.

Diagnosis. The combination of impunctate T1 and metallic colouration does not occur on any other species. Female with head and mesoscutum dull metallic green-gold, metasoma brown with posterior marginal area of tergites light brown, frons smooth, mesoscutum dull, impunctate though with conspicuous reticulate pattern, entire surface impunctate, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae set well below dorsal level, fore tibial spur fan shaped. Male with head dark green, mesoscutum and scutellum bright green, propodeum dark green suffused with brown, metasoma brown, antennae moderately long (FL 1.80 × UID), AS4:AS2+3=1, genal hair forming a beard, fore coxae densely covered with long, hair, S2–S4 with rows of plumose hair.

Description of female. Body length 4.24–5.00 mm ($\bar{x}$=4.71 mm, SD=0.21, n=10), head width 1.32–1.50 mm (n=10), forewing length 1.10–1.22 mm ($\bar{x}$=1.14 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 80–82, UID 60–61, LID 57–58, AOD 18–19, IAD 14–15, OAD 31–32, IOD 23–24, OOD 12–13, CL 19–20, GW 14–16, EW 27–28, SL 36–38, FL 66–68.

Structure. Head broadly triangular, inner orbits slightly converging below, median frontal carina reaches median ocellus, upper portion of carina weak, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.34 × LID), weakly convex, basal half shining, mesially closely punctate with a few large, deeply impressed punctures, laterally smooth and impunctate, anteriorly dull with fine transverse lineolation, openly punctate with small, shallow rounded punctures, supraclypeal area slightly raised mesially, with a few indistinct punctures mesially. Frons (fig. 102A) smooth with a fine reticulate pattern above antennal bases, sculpture laterally with a few striae to punctate along margin of inner orbits, extends vertically to level of anterior margin of median ocellus. Labrum (fig. 102B) median basal area forming V-shaped tubercles, anterior margin bluntly obtuse mesially, forming raised lip, distal process triangular, widest at base, median keel extends to distal margin, lateral ridges not grossly enlarged, extend to lateral margin, distal margin setae sparse, lateral teeth absent. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 102C) anterior margin rounded, surface with a dull sheen, covered with a conspicuous reticulate pattern, entire surface impunctate. Scutellum length equal to dorsal surface of propodeum, surface with reticulate pattern similar to mesoscutum, with a few small, shallow punctures laterally. Dorsal surface of propodeum (fig. 102C) defined by posterolateral carinae set well below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate with a few lateral striae, sculpture mesially almost reaching dorsal rim, not reaching laterally, rim dull, rounded onto vertical surface. T1–T5 impunctate, covered with fine transverse lines. Mesepisternum and metepisternum smooth except a few fine striae on upper portion of mesepisternum. Fore tibial spur fan shaped (cf. fig. 17B); BP broadly rounded.

Colour. Head and mesoscutum dull metallic green-gold, metasoma brown with posterior marginal area of tergites light brown, mandibles amber, red-brown apically, basal half of clypeus black, anterior half and supraclypeal area blue, antennal flagellum underneath light brown, apical one third of femora, tibiae and tarsi light brown, remainder dark brown.

Vestiture. Body sparse, frons and paraocular areas with some erect, minutely branched hair, mesoscutum with sparse cover of similar shorter hair, metasomal tomentum absent.

Description of male. Body length 3.70–4.54 mm ($\bar{x}$=4.10 mm, SD=0.25, n=10), head width 1.26–1.34 mm (n=10), forewing length 0.94–1.08 mm ($\bar{x}$=1.01 mm, SD=0.05, n=10). Relative dimensions: HW 100, HL 76–78, UID 60–62, LID 54–55, AOD 17–18, IAD 15–16, OAD 26–27, IOD 25–26, OOD 12–13, CL 18–19, GW 14–16, EW 32–33; ML 40–42, SL 24–26, FL 110–112.

Structure. Head broad, inner orbits converging weakly below, median frontal carinae well developed, reaches median ocellus, frons smooth, clypeus short, weakly concave mesially, openly to closely punctate though punctures indistinct, basal two thirds bright yellow, supraclypeal area flat, impunctate. Antennae moderately long (FL 1.80 × UID), AS4:AS2+3=1. Remainder similar to female except pronotal dorsolateral angles well projected, mesoscutum shining to polished, sparsely punctate though punctures distinct, scutellum polished, slightly convex, impunctate, dorsal surface of propodeum not defined, surface smooth, highly polished, with a few transverse striae, metasomal tergites densely punctate; colour similar except mandibles, clypeus as noted, antennal scapes and flagellum underneath bright yellow, frons dark green, mesoscutum and scutellum bright green, propodeum dark green suffused with brown, metasoma brown with posterior marginal areas light brown, legs as in female but with basal two-thirds of femora brown; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Frons, paraocular areas and supraclypeal area with dense cover of short, plumose, adpressed hair forming a mat, genal hair long forming a beard, fore coxae densely covered with long, plumose hair, mesoscutum with sparse cover with long, erect, minutely branched hair, metasomal tomentum absent; S2–S4 with rows of posteriorly directed, plumose hair, hair on S4 shorter than on S2, S5 and S6 with simple, semi-adpressed hair.

Genitalia and associated sterna (figs 102E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli long, grossly enlarged apically with dense cover of long hair, branched on only one side of hair shaft, retrorse lobes glabrous, well-developed, ventral flanges present; S8 median process elongate, broadly rounded, with a few simple and branched hair, S7 median process rounded, glabrous.

Distribution (fig. 102D). Northern half of the Eyrean Province.

Etymology. The epithet *immaculatum* refers to the impunctate mesoscutum and metasomal tergites.

Floral Forage Record. Families visited=15. Catch total=74; Amaranthaceae (1 catch), Anacardiaceae (1), Asclepiadaceae (1), Campanulaceae (1), Compositae (1), Dicrastylidaceae (1), Fabaceae (11), Goodeniaceae (2), Hydrocotylaceae (1), Malvaceae (1), Myoporaceae (3), Myrtaceae (38), Portulacaceae (2), Proteaceae (9), Sapindaceae (1). Genera visited=21; *Acacia* (8), *Calandrinia* (2), *Cassia* (2), *Dicrastylis* (1), *Eremophila* (3), *Eucalyptus* (36), *Grevillea* (6), *Hakea* (3), *Helichrysum* (1), *Heterodendrum* (1), *Jacksonia* (1), *Melaleuca* (1), *Micromyrtus* (1), *Ptilotus* (1), *Sarcostemma* R.Br. (1), *Scaevola* (1), *Schinus* (1), *Sida* (1), *Trachymene* (1), *Velleia* (1), *Wahlenbergia* (1).

Flight Phenology.

3	6	2	0	0	0	1	11	12	20	27	5
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum immaculatum is one of only two metallic species which occurs primarily in the northern half of Eyrean province. Other metallic species occur in the southern half of the Eyrean, many closely following the mallee floral area.

Morphologically, the impunctate mesoscutum and metasomal tergites on the females are unusual characters. A few male specimens show macrocephaly of the genae, clypeus and mandibles.

Lasioglossum (Chilalictus) inflatum sp. nov.

Figures 103A–H

Material examined. Holotype. ♀, Western Australia, 35 km E of Norseman (32°12′S, 122°04′E), 30 Oct 1989, KLW, on *Eremophila* (NMV T-15608).

Paratypes (8♀♀, 8♂♂). Western Australia: 2♀♀, 6 km E of Yellowdine (31°18′S, 119°44′E), 10 Oct 1981, IDN & JCC, on *Eremophila* (ANIC); 1♀, 7♂♂, 40 km N of Norseman (31°52′S, 121°47′E), 20 Nov 1989, KLW, on *Eremophila* (NMV; ♀ T-15609, ♂♂ T-15610–15616); 2♀♀, 35 km WNW of Balladonia RH (32°12′S, 123°18′E), 18 Sep 1981, IDN & JCC, on *Eremophila* (ANIC); 1♀, same data as holotype (NMV T-15617); 2♀♀, 17 km WNW of Balladonia RH (32°17′S, 123°28′E), 18 Sep 1981, IDN & JCC (ANIC); 1♂, 40 mi (64 km) E of Norseman (32°35′S, 121°54′E), 10 Jan 1970, TFH, on *Eucarya* (SAM).

Diagnosis. Most like *L. biceps* but with different metasomal colour. Female with head and mesosoma black, metasoma light red-brown except anterior half of T1 black, frons striate, pronotal dorsolaterally rounded, not projected, mesoscutum punctation moderately fine, surface dull, closely to densely punctate, dorsal surface of propodeum ruguloso-striolate, weakly defined by posterolateral carinae, fore tibial spur fan shaped. Male with antennae moderately short (FL 1.46 × UID), fore femora underneath with enlarged boss basally, fore coxae with sparse hair cover, S2 with hair not extending to lateral margin, S3 and S4 with posteriorly directed

adpressed hair, forewings with 2nd r-m as weaker than 1st r-m.

Description of female. Body length 4.08–4.54 mm ($\bar{x}$=4.33 mm, SD=0.15, n=8), head width 1.20–1.25 mm (n=8), forewing length 1.08–1.15 mm ($\bar{x}$=1.12 mm, SD=0.03, n=8). Relative dimensions: HW 100, HL 92–94, UID 61–62, LID 56–58, AOD 19–20, IAD 8–10, OAD 34–35, IOD 25–26, OOD 14–15, CL 21–22, GW 20–21, EW 25–26, SL 36–37, FL 72–74.

Structure. Head elongate, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaching just short of median ocellus. Clypeus mostly projected below lower level of eyes, short (CL 0.38 × LID), convex, more so ventrally, basal two-thirds with a dull sheen, openly to sparsely punctate with small shallow punctures, anteriorly dull, covered with fine reticulate pattern, impunctate, supraclypeal area almost flat, dull, covered with fine reticulate pattern, with a few indistinct punctures. Frons (fig. 103A) striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 103B) basal median area raised, weakly ridged, anterior margin bluntly obtuse mesially, weakly raised forming lip, anterolateral corners angular, distal process not tapered, widest at base, median keel extends beyond distal margin, lateral ridges small, not extending to margin, distal margin setae sparse, lateral teeth small, distally hooked. Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 103C) anterior margin rounded, punctation moderately fine, surface dull covered with fine reticulate pattern, anteriorly impunctate, remainder closely to densely punctate with small, shallow rounded punctures. Scutellum length equal to dorsal surface of propodeum length, surface dull, openly punctate. Dorsal surface of propodeum (fig. 103C) weakly defined by posterolateral carinae set well below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal sculpture ruguloso-striolate, not reaching dorsal rim, rim with a dull sheen. T1 densely punctate except posterior marginal area impunctate, T2 impunctate on posterior half. Mesepisternum and metepisternum weakly striate to smooth. Fore tibial spur fan-shaped; BP rounded.

Colour. Head and mesosoma black, metasoma light red-brown except anterior half of T1 black, mandibles light red-brown except apically dark red-brown, antennae dark brown above, light brown underneath, fore and mid apical portion of femora and tibiae and tarsi light red-brown remainder dark brown to black, hind basitibial plate light red-brown (in some specimens basal half of hind tibiae light red-brown, remainder dark brown).

Vestiture. Body sparse, a few long branched hairs in paraocular areas, clypeus almost bare, frons with short hair and a few longer branched hairs, mesoscutum with short erect branched hair, weak tomentum laterally on T2, across T3.

Description of male. Body length 3.54–4.00 mm ($\bar{x}$=3.79 mm, SD=0.16, n=7), head width 1.13–1.27 mm (n=7), forewing length 0.99–1.10 mm ($\bar{x}$=1.05 mm, SD=0.04, n=7). Relative dimensions: HW 100, HL 88–90, UID 60–62, LID 44–45, AOD 15–16, IAD 12–13, OAD 33–34, IOD 27–28, OOD 14–15, CL 20–21, GW 17–18, EW 31–32; ML 38–40, SL 24–25, FL 89–91.

Structure. Head elongate, inner orbits converging below, eyes appear bulbous in frontal view, with distinct cover of short setae, clypeus shining, appears impunctate, pale yellow on basal half, supraclypeal area flat, with a dull sheen. Antennae moderately short (FL 1.46 × UID), AS4:AS2+3=1. Remainder of body similar to female except, lateral margin of mesoscutum with dull sheen, surface openly to closely punctate, scutellum highly polished almost impunctate, dorsal surface of propodeum posterolateral carinae present though weak, dorsal rim shining; body black except clypeus as noted, flagellum light brown underneath, tergites with posterior marginal area brown, legs with apical portion of femora, tibiae and tarsi light red-brown, fore femora underneath with enlarged boss, apically surface smooth, broad and slightly concave (cf. fig. 19E); forewings with 2nd r-m as weaker than 1st r-m.

Vestiture. Lower frons, paraocular areas, clypeus and supraclypeal area with short, adpressed plumose hair forming a mat, fore coxae with sparse hair cover, remainder similar to female except lateral tomentum just present on T2 and T3. S2 with short, semi-erect, branched hair, hair not extending to lateral margin, S3 and S4 with short, adpressed, branched, posteriorly directed hair, S5 with a few simple, adpressed, posteriorly directed hairs.

Genitalia and associated sterna (figs 103E–H). Gonobase sides slightly narrowed basally, gonocoxite without setae, gonostyli long, apically enlarged, with a few short setae, except with several long apical setae, retrorse lobes not well

developed, coarsely setose with large spine-like setae basally, ventral flanges absent; S8 median process short with spine-like apical process, glabrous, S7 median process apically rounded.

Distribution (fig. 103D). Arid areas of southern Western Australia.

Etymology. The epithet *inflatum* refers to the enlarged fore femora on males.

Floral Forage Record. Families visited=2. Catch total=5; Myoporaceae (4 catches), Santalaceae (1); Genera visited=2; *Eremophila* (4), *Eucarya* (1).

Flight Phenology.

1	0	0	0	0	0	0	0	2	2	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. See *Remarks* for *L. biceps.*

Lasioglossum (Chilalictus) instabilis (Cockerell)

Figures 10D, 104A–H

Halictus instabilis Cockerell, 1914a: 510.
Halictus elliotii Rayment, 1929: 125. syn. nov.
Lasioglossum (*Chilalictus*) *instabilis.* — Michener, 1965: 176.
Lasioglossum (*Chilalictus*) *elliotii.* — Michener, 1965: 176.

Material examined. Holotype of *instabilis.* ♀, Victoria, Croydon (37°48′S, 145°17′E), presented by Miss A.M. Fulton, 17 Feb 1909, 77, USNM Type No. 58178 (USNM, missing right mid femur, tibia and tarsi).

Holotype of *elliotii.* ♀, Victoria, Cann River (37°34′S, 149°09′E), Nov 1928, J. Clark, T-10395 (NMV, missing right hind leg, left mid tarsi and hind tibia and tarsi).

Other specimens examined (268♀♀, 30♂♂). Queensland: Stanthorpe, Dalveen, Boonah, Burleigh, Brisbane, Woodford, Beerwah, Caloundra, Landsborough, Tin Can Bay, Burrum Heads, Goodwood, Paluma, Walshs Pyramid.

New South Wales and Australian Capital Territory: Lane Cove Reserve, Nadgee Reserve, Cotter River, Canberra, Jervis Bay, Colo Vale, Royal National Park, Sydney, Lugarno, Rankin Springs, Lane Cove, Blue Mts Nat. Pk, Grose Vale, Mt Tomah, Clarence, Bilpin, Home Rule, Camden Haven, Coonabarabran, Armidale, Mt Kaputar, Hasting Point.

Victoria: Wilsons Promontary, Anglesea, Dromana, Beaconsfield, Emerald, Belgrave, Upwey, Lakes Entrance, Ferntree Gully, Croydon, Nowa Nowa, Brisbane Ranges, Warburton, Coranderrk, Cann River, Dunkeld, Stawell, Kiata, Wilkur.

South Australia: Vivonne Bay, Kangaroo Island, Victor Harbour, Mt Compass, Toorak, Athelstone, Birdwood, Port Lincoln, South Para.

Western Australia: Jingalup, Gnowangerup, Point Malcolm, Lake Grace, Perth, Boorabbin Rock, Dedari.

Diagnosis. Mesoscutum colour unlike any other species. Both sexes black with a bluish tinge. Female with frons reticulate/striate, mesoscutum anterior margin with weak mesial projection, surface with dull lustre, almost greasy appearance, in parapsidal areas closely to densely punctate, mesially openly to closely punctate, dorsal surface of propodeum rugulosostriolate, not defined by carina. Male with antennae moderately short, AS4:AS2+3=1, S2–S4 with moderate cover of long, erect hair, S5 and S6 semi-adpressed, simple hair, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.85–10.01 mm ($\bar{x}$=9.25 mm, SD=0.55, n=10), head width 2.35–2.84 mm (n=10), forewing length 2.00–2.47 mm ($\bar{x}$=2.29 mm, SD=0.12, n=10). Relative dimensions: HW 100, HL 82–85, UID 57–61, LID 53–55, AOD 21–22, IAD 9–10, OAD 25–26, IOD 17, OOD 16–17, CL 21–23, GW 18–22, EW 24–25, SL 42–43, FL 65–69.

Structure. Head broad, inner orbits converging slightly below, median frontal carina extends to median ocellus, upper portion of carina weak, eyes with sparse cover with conspicuous setae. Scape reaches posterior margin of lateral ocelli. Clypeus and supraclypeal area distinctly raised above the contours of the frons and paraocular areas, clypeus short (CL 0.41 × LID), convex basally, surface with a dull sheen except anteriorly shining, densely covered with large, deeply punctures, some mesial punctures elongated forming longitudinal grooves, supraclypeal area dull, closely punctured with small, shallow, rounded punctures. Frons (fig. 104A) reticulate/striate above antennal bases, sculpture laterally continues to almost smooth along inner orbits, extends vertically to anterior margin of lateral ocelli, ocellocciputal area distinctly concave. Labrum (fig. 104B) basal median area raised, coarsely nodulated, some nodules joined forming irregular ridges, anterior margin rounded, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges serrate, extends to distal margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles obtuse, weakly projected. Mesoscutum (fig. 104C) anterior margin with weak, rounded (though bilobed in some specimens (fig. 10D)) mesial projection, punctation moderately coarse, surface with dull lustre, almost greasy appearance, anteriorly impunctate, along midline and in parapsidal areas closely to densely

punctate, mesially openly to closely punctate. Scutellum 1.3 × longer than dorsal surface of propodeum, surface with similar mesoscutal sheen, slightly concave along midline, densely punctate along midline and around margin, remainder openly to closely punctate. Dorsal surface of propodeum (fig. 104C) not defined by carina, posterovertical carinae extends less than half way to dorsal level, dorsal sculpture ruguloso-striolate on basal half, a few striae laterally, sculpture not reaching dorsal rim, rim rounded, a few specimens with almost smooth dorsal surface of propodeum (fig. 10D). T1 densely punctate. Mesepisternum and metepisternum coarsely striate, lower half of metepisternum reticulate. BP rounded.

Colour. Body black, mesoscutum and metasoma with dull blue tinge, mandibles red-brown apically, antennal flagellum light brown underneath, metasomal tergites posterior marginal areas and legs brown.

Vestiture. Body sparse, frons and paraocular areas with long, erect, branched hair, mesoscutum with similar hair shorter hair, tomentum present laterally on T2, across T3 and T4.

Description of male. Body length 6.39–7.55 mm ($\bar{x}$=7.07 mm, SD=0.39, n=10), head width 1.88–2.07 mm (n=10), forewing length 1.64–1.95 mm ($\bar{x}$=1.83 mm, SD=0.10, n=10). Relative dimensions: HW 100, HL 84–86, UID 61–62, LID 48–49. AOD 16–17, IAD 12–13, OAD 25–26, IOD 18–19, OOD 17–18, CL 22–23, GW 20–21, EW 28–30; ML 40–41, SL 28–31, FL 110–115.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of conspicuous setae, clypeus and supraclypeal area shining, distinctly raised above surrounding contours, clypeus with several large, deeply impressed mesial punctures, pale yellow/white markings on basal third, scape not reaching median ocellus. Antennae moderately short (FL 1.86 × UID), AS4:AS2+3=1. Remainder of body similar to female but with frons ruguloso-striolate, mesoscutum mesially openly punctate, propodeal sculpture reaching rim at least laterally; mesepisternum and metepisternum almost smooth; colour similar to female except metasomal colour with distinct blue tinge, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, lower paraocular areas with some short, adpressed, plumose hair, weak lateral metasomal tomentum on T2 and T3; S2–S4 with moderate cover of long, erect, branched setae present across sternite, S5 and S6 with semi-adpressed, posteriorly directed simple hair.

Genitalia and associated sterna (figs 104E–H). Gonobase sides slightly flanged basally, gonocoxite setose on apical inner margin, gonostyli setae simple, retrorse lobes setose, well developed, ventral flanges absent, S8 median process tapered to obtuse point, with simple setae; S7 median process rounded, glabrous.

Distribution (fig. 104D). Bassian province (except Tasmania), with a few records from northern Queensland.

Floral Forage Record. Families visited=12. Catch total=44; Compositae (1 catch), Dilleniaceae (12), Epacridaceae (2), Fabaceae (3), Goodeniaceae (1), Haloragidaceae (1), myrtaceae (13), Orchidaceae (3), Pittosporaceae (1), Proteaceae (4), Saxifragaceae (1), Xanthorrhoeaceae (2); Genera visited=21; unidentified genus of Fabaceae (1), *Acacia* (2), *Bauera* (1), *Bursaria* (1), *Calytrix* (1), *Conospermum* (1), *Eucalyptus* (6), *Gliscocaryon* Endl. (1), *Goodenia* (1), *Grevillea* (1), *Hakea* (1), *Helichrysum* (1), *Hibbertia* (12), *Kunzea* (2), *Leptospermum* (2), *Leucopogon* (2), *Lomatia* R.Br. (1), *Melaleuca* (1), *Thelymitra* (3), *Verticordia* (1), *Xanthorrhoea* (2).

Flight Phenology.

12	6	6	5	2	0	3	5	20	23	18	18
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Intraspecific variation occurs as sculpture differences on the dorsal surface of the propodeum of females. The sculpture is smooth (fig. 10D) on a number of specimens from southern New South Wales and Victoria, rather than ruguloso-striolate (fig. 104C). Other specific characters were similar. I consider these specimens to be conspecific.

Lasioglossum (Chilalictus) lamellosum sp. nov.

Figures 18C,F, 21E, 29A, 29B, 105A–H

Material examined. Holotype. ♀, New South Wales, 34 km SE of Moree (29°58′S, 150°29′E), 30 Nov 1976, EME & T. Low, on *Atalaya hemiglauca* (QM T13909).

Paratypes (4♀♀, 17♂♂). Queensland: 1♂, Drillham (26°38′S, 149°58′E), 26 Oct 1979, KLW, on *Eucalyptus* (UQIC); 2♀♀, 16♂♂, 5 km E of Moonie (27°43′S, 150°28′E), 20 Dec 1976, EME & T. Low, on *Melaleuca lanceolata* (UQIC).

New South Wales: 2♀♀, 34 km SE of Moree, (29°58′S, 150°29′E), 30 Nov 1976, EME & T. Low, on *Atalaya hemiglauca* (UQIC)

Diagnosis. Most like *L. falcatum.* Both sexes

with head and mesosoma black, metasoma dark brown. Female with frons reticulate, mesoscutum punctation moderately coarse, surface shining, dorsal surface of propodeum rugulosostriolate, defined by angular posterolateral carinae, outer hind tibial spur sharply recurved. Male with antennae moderately long, mid coxae with large, lamella-like processes, outer hind tibial spur sharply recurved, mid coxal plates, hind coxae and trochanters densely covered with long plumose hair, S5 with two small median tufts of hair, tufts arched mesially, genitalia with retrorse lobes weakly developed, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.54–7.70 mm ($\bar{x}$=7.08 mm, SD=0.55, n=4), head width 2.16–2.26 mm (n=4), forewing length 1.69–1.93 mm ($\bar{x}$=1.80 mm, SD=0.10, n=4). Relative dimensions: HW 100, HL 75–78, UID 59–61, LID 53–54, AOD 19–20, IAD 14–15, OAD 22–24, IOD 19–20, OOD 14–15, CL 20–21, GW 13–14, EW 25–26, SL 38–40, FL 65–66.

Structure. Head broadened, inner orbits converging below, median frontal carina reaches median ocellus, upper portion of carina weak, eyes with sparse cover of minute setae. Scape reaches posterior margin of lateral ocelli. Clypeus short (CL 0.38 × LID), convex, shining except along anterior margin, coarsely roughened along basal margin, densely punctate, punctures rounded to ovoid, anteriorly surface finely reticulate, indistinctly punctate, supraclypeal area not projected, continues contours of clypeus, surface dull, closely punctate. Frons (fig. 105A) reticulate above antennal bases, sculpture laterally weakens to almost smooth, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 105B) basal median area weakly raised, surface with several raised ridges, anterior margin rounded, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges serrate, extend to margin, setae almost extend across distal margin, lateral teeth small, not distally hooked. Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 105C) anterior margin rounded, punctation moderately coarse, surface shining except anteriorly dull with fine lineolation, mesially closely to densely punctate, laterally in parapsidal areas densely punctate. Scutellum 1.14 × longer than dorsal surface of propodeum, surface shining, striate along midline, densely punctate around margins, remainder openly to sparsely punctate. Dorsal surface of propodeum (fig. 105C) defined by angular posterolateral carinae set at or just below dorsal level, posterovertical carinae extend to dorsal carinae, sculpture ruguloso-striolate, sculpture reaches dorsal rim. T1 densely punctate. Mesepisternum and metepisternum striate. BP rounded; inner hind tibia with single large tooth, remainder of margin wavy (fig. 18C), outer hind tibial spur sharply recurved (fig. 18F).

Colour. Head and mesosoma black except mandibles red-brown apically, antennae dark brown above, light brown underneath, metasoma dark brown, legs light brown.

Vestiture. Body sparse, paraocular areas with erect branched hair, frons with simple hair, between antennal bases small tuft of branched hair, mesoscutum with erect branched hair, metasomal tomentum lateral on T2 and T3, across tergite, although narrowed mesially, on T4.

Description of male. Body length 5.47–6.54 mm ($\bar{x}$=6.00 mm, SD=0.39, n=10), head width 1.69–1.93 mm (n=10), forewing length 1.39–1.57 mm ($\bar{x}$=1.48 mm, SD=0.06, n=10). Relative dimensions: HW 100, HL 80–83, UID 61–62, LID 45–46, AOD 16–17, IAD 14–16, OAD 24–25, IOD 19–20, OOD 15–16, CL 20–21, GW 12–14, EW 29–32, ML 33–35, SL 31–32, FL 118–120.

Structure. Head broad, inner orbits converging below, eyes with a distinct cover of minute setae, scapes extend to anterior margin of median ocellus, clypeus convex, shining, openly to closely punctate with shallow punctures, basal half to two-thirds pale yellow, supraclypeal area flat, shining. Antennae moderately long (FL 1.94 × UID), AS4:AS2+3=1. Remainder of body and colour similar to female with dorsal surface of propodeum defined by angular posterolateral carinae set well below dorsal level, dorsal sculpture coarsely rugose-striolate, mesoscutum mesial punctation openly to closely punctate; mid coxae with large, thin, elliptical, lamella-like processes, at least half length of trochanters, processes translucent (fig. 21E); forewings with 2nd r-m as strong as 1st r-m; outer hind tibial spur sharply recurved.

Vestiture. Face except clypeus with short adpressed plumose hair, almost forming a mat, clypeus with similar hair on anterior half only, mid coxal plates, hind coxae and trochanters densely covered with long plumose hair (fig. 21E); S2 with long plumose median tufts of hair, hair not reaching lateral margins, S3 and S4 with short, branched, posterolaterally directed hair across anterior margin of sternites (fig. 29A), S5

with two small median tufts of hair, tufts arched mesially (fig. 29B).

Genitalia and associated sterna (figs 105E–H). Gonobase sides narrowed basally, gonocoxite broad apically, lateral setae present, with several long simple hairs at outer insertion point of gonostyli with gonocoxite, gonostyli long, apically swollen, long plumose hair apically, retrorse lobes weakly developed as short, thin lamella, a few setae, ventral flanges absent; S8 median process elongate, broadly truncate, glabrous, S7 median process rounded, glabrous.

Distribution (fig. 105D). Southeastern Queensland, the western side of the Great Dividing Range and the northern New South Wales tablelands.

Etymology. The epithet *lamellosum* refers to the "lamella-like" processes on the mid coxae of males.

Floral Forage Record. Families visited = 2. Catch total = 3; Myrtaceae (2 catches), Sapindaceae (1). Genera visited = 3; *Atalaya* (1), *Eucalyptus* (1), *melaleuca* (1).

Flight Phenology.

0	0	0	0	0	0	0	0	0	1	1	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Mid coxal lamella-like processes on males are known from only two species. *L. lamellosum* and *L. moreense* (see *Remarks* on *L. falcatum*). These species are sympatric over a restricted distributional range in the rain shadow of the Great Dividing Range. The weak development of the retrorse lobes on the male genitalia and the recurved outer hind tibial spur on both sexes are unusual characters. The head length of the female is amongst the shortest recorded for the subgenus. Although few specimens are known, *L. lamellosum* appears to be univoltine.

Lasioglossum (Chilalictus) lanarium (Smith)

Figures 7A, 9A, 21A, 106A–H

Halictus lanarius Smith, 1853: 57–58.
Halictus lanuginosus Smith, 1879: 34, syn. nov.
Halictus mitchelli Cockerell, 1906: 58, syn. nov.
Lasioglossum (*Chilalictus*) *lanarium*. — Michener, 1965: 176.
Lasioglossum (*Chilalictus*) *languinosum* Michener, 1965: 176. (lapsus).
Lasioglossum (*Chilalictus*) *mitchelli*. — Michener, 1965: 177.

Material examined. Holotype of *lanarius*, ♀, New South Wales, Hunter River (31°32′S, 151°10′E), (label data reads: N. Holl. Hunter), BM Type Hym 17.a.894 (BMNH, missing left flagellum.)

Syntype of *lanuginosus*, ♂, Australia, BM Type Hym 17.a.901 (BMNH).

Holotype of *mitchelli*, ♀, Tasmania, Hobart (42°53′S, 147°19′E), 91-155, 3230, J.J. Walker, BM Type Hym. 17.a.933 (BMNH; head reglued to mesoscutum, missing distal six flagellar segments of left antenna, left wings and right forewing, fore tarsi and right hind tarsal segments.)

Other specimens examined (363♀♀, 714♂♂). Queensland: Emu Vale, Glen Aplin, Stanthorpe, Lamington Nat. Pk, Leyburn, Mt Tambourine, Toowoomba, Brisbane, Murphys Creek, Oakey, Beerwah, Bunya Mts, Montville, Nanango.

New South Wales and Australian Capital Territory: Nadgee Reserve, Cooma, Albury, Tuross, Thurgoona, Dubbo, Captains Flat, Lobbs Hole, Brindabella Ra., Cotter River, Canberra, Murrumbateman, Shoalhaven, Upper Kangaroo Valley, Barren Grounds, Moss Vale, Leeton., Bulli Lookout, Young, Coeoparra Nat. Pk, Camden, Liverpool, West Wyalong, Sydney, Concord, Rydalmere, Roseville, Doonside, Blue Mts, Mt Wilson, Hillston, Mt Canobolis, Belmont, Newcastle, Singleton, Chichester, Barrington Tops, Gilgandra, Floral Forage Reserve, Coonabarabran, Yeovil, Uralla, Armidale, Dorrigo, Guyra, LLangothlin, Ben Lomond, Bulloek Creek, Deepwater, Tenterfield.

Victoria: Toora, Lorne, Timboon, Anglesea, Rye, Rosebud, Portland, Yinnar, Barwon Heads, Traralgon, Yallourn, Melbourne, Healesville, Whittlesea, Gisborne, Creswick, Buxton, Mt Maeedon, Flowerdale, Cann River, Yea, Alexandra, Halls Gap, Omeo, Merrijig, Edenhope, Bendigo, Mt Arapiles, Mt Hope, Tawonga, Myrtleford, Mooroopna, Eehuea, Wilkur, Kerang, Ouyen.

Tasmania: Hobart, Mt Stuart, New Town, New Norfolk, Plenty, Gretna, Bothwell, Campbell Town, Launeeston, Barrow Ck, Devonport, Branxholm, George Town, Bridport, Stanley.

South Australia: Mt Gambier, Konetta, Robe, Kongal, Bordertown, Kangaroo Is., Seal Bay, Parndana, Meningie, Tapanappa, Vietor Harbour, Waitpinga, Yumali, Goolwa, Normanville, Finniss, Mt Compass, Angas Plains, Aldinga, Ferries-McDonald Nat. Pk, Hartley, TeaTree Gully, Hallett Cove, Scotts Creek, Mt Barker, Monarto, Belair, Aldgate, Billiatt, Bridgewater, Mt Lofty, Adelaide, Burnside, Port Lincoln, Hindmarsh, Gilberton, Athelston, Birdwood, Wanbi, Nuriootpa, Androssan, Wild Horse Plains, Waikerie, Golden Grove, Kadina, Collinsfield, Lake Newland, Port Germein, Murray Town, Melrose, Wilmington, Orroroo, Streaky Bay, Yunta, Winnininnie.

Western Australia: Bornholm, Manjimup, Augusta, Karridale, Borden, Calgardup, Toompup, Rosa Glen, Hopetown, Jingalup, Margaret River, Cowaramup, Broomehill, Katanning, Dingup, Mullalyup, Wilga, Busselton, Badgebub, Ludlow, Donnybrook, Capel, Dumbleyung, Harvey, Narrogin, Perth, Midland, Morawa, Dongara.

Diagnosis. Body size and sculpture unlike any other species. Both sexes black. Female with frons coarsely punctate, mesoscutum anterior margin with bilobed mesial projection, punctation conspicuously coarse, surface dull, densely punctate, dorsal surface of propodeum not defined by carinae, dorsal rim slightly raised and angular, weakly recessed mesially. Male with antennae moderately short, AS4:AS2+3=0.7, S2–S4 with long, plumose hair, S5 hair forming weak tufts, S6 with simple hair weakly posteromesially directed, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 8.62–11.93 mm ($\bar{x}$=10.03 mm, SD=0.80, n=10), head width 2.66–3.06 mm (n=10), forewing length 2.26–2.84 mm ($\bar{x}$=2.54 mm, SD=0.15, n=10). Relative dimensions: HW 100, HL 80–84, UID 62–64, LID 56–58, AOD 21–22, IAD 9–11, OAD 21–23, IOD 16–17, OOD 17–19, CL 20–22, GW 18–21, EW 22–23, SL 40–41, FL 68–72.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes conspicuously covered with moderately long setae (fig. 7A). Scape reaches at least posterior margin of lateral ocelli. Clypeus short (CL 0.38 × LID), convex basally, surface coarsely roughened, shining or some specimens with a dull sheen, basal half with large, deeply impressed, irregular shaped punctures, anteriorly with small, rounded punctures, all densely punctate, supraclypeal area well projected, shining, sparsely punctate mesially, closely to densely punctate around margin. Frons (fig. 106A) coarsely punctate above antennal bases, punctures with raised ridges giving reticulate pattern, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli, ocelloccipital areas weakly concave. Labrum (fig. 106B) basal median area broadly raised, surface nodulated, anterior margin rounded, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges weak, not reaching distal margin, distal margin setae sparse, lateral teeth large, distally hooked. Pronotum dorsolateral angles sharply obtuse, projected. Mesoscutum (fig. 106C) anterior margin with bilobed mesial projection, punctation conspicuously coarse, surface dull, densely punctate except anterolaterally scabrous, mesially closely punctate, punctures in parapsidal areas and laterad of parapsidal lines contiguous. Scutellum 1.3 × longer than dorsal surface of propodeum, with a dull sheen, openly to sparsely punctate, except along midline and along posterior margin densely punctate. Dorsal surface of propodeum (fig. 106C) not defined by carinae, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture ruguloso-striolate mesially, striolate laterally, sculpture not reaching rim, dorsal rim slightly raised and angular, weakly recessed mesially. T1 densely punctate. Mesepisternum and metepisternum striate. BP bluntly obtuse.

Colour. Body black except mandibles apically red-brown, antennal flagellum dark brown above, light brown underneath, ocelloccipital areas tinged with steel blue, legs dark brown, posterior marginal area of tergites light brown, remainder of T3–T5 suffused with brown.

Vestiture. Body with moderate hair cover, frons with sparse cover of erect, minutely branched hair, paraocular areas with long, erect, branched hair, mesoscutum with similar shorter hair, metanotum with hair tuft across anterior margin, metasomal tomentum laterally on T2, across T3–T5.

Description of male. Body length 7.70–10.39 mm ($\bar{x}$=9.02 mm, SD=0.73, n=10), head width 2.31–2.85 mm (n=10), forewing length 2.02–2.51 mm ($\bar{x}$=2.27 mm, SD=0.16, n=10). Relative dimensions: HW 100, HL 82–87, UID 65–67, LID 54–57, AOD 20 — 21, IAD 10–13, OAD 20–22, IOD 18–19, OOD 18–19, CL 21–23, GW 20–23, EW 25–26, ML 40–41, SL 30–31, FL 90–95.

Structure. Head broad, inner orbits converging below, eyes with conspicuous cover of long setae, clypeus weakly convex, densely punctate with shallow punctures, pale white marking on least basal half, scape reaches median ocellus, sculpture similar to female. Antennae moderately short (FL 1.42 × UID), AS4:AS2+3=0.7. Remainder of body similar to female except mesoscutal anterolaterally punctate, mesially openly to closely punctate, surface with a dull sheen, dorsal surface of propodeum sculpture weak, dorsal rim lip defined though not raised, rim smooth with a dull sheen; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body with moderate cover, frons and paraocular areas with short, adpressed, plumose hair, forming a mat in paraocular areas, clypeus and supraclypeal area with a few branched hairs, mesoscutum with long, erect, branched hair, lateral tomentum on T2 and T3; S2–S4 with long, posteriorly directed, plumose hair across each sternite, S5 with simple and branched hair, lateral hair slightly longer form-

ing weak tufts, S6 with simple hair weakly posteromesially directed.

Genitalia and associated sterna (figs 106E–H). Gonobase sides parallel, gonocoxite with setae on apical inner margin, dorsal and lateral surfaces, dorsal setae bifurcate, insertion points slightly sunken, gonostyli setae long and simple, retrorse lobes well developed, setose, ventral flanges absent; S8 median process produced as an elongate, constricted process, apically rounded with simple setae, S7 median process rounded, setae present.

Distribution (fig. 106D). Bassian province.

Floral Forage Record. Families visited=29. Catch total=97; Aizoaceae (1 catch), Anacardiaceae (1), Campanulaceae (10), Casuarinaceae (1), Compositae (25), Convolvulaceae (1), Cruciferae (2), Cupressaceae (1), Dilleniaceae (1), Dipsacaceae (2), Fabaceae (7), Goodeniaceae (1), Iridaceae (1), Labiatae (2), Liliaceae (3), Malvaceae (2), Meliaceae (1), Myoporaceae (1), Myrtaceae (12), Orchidaceae (1), Oxalidiaceae (1), Papaveraceae (1), Pittosporaceae (8), Polygonaceae (1), Proteaceae (2), Ranunculaceae (3), Rosaceae (2), Sapindaceae (1), Xanthorrhoeaceae (2). Genera visited=52; unidentified genera of Compositae (4), *Acacia* (1), *Allocasuarina* Adans. (1), *Arctotheca* (1), *Asphodelus* (1), *Atalaya* (1), *Bursaria* (8), *Cakile* (1), *Calendula* (1), *Calytrix* (1), *Carpobrotus* (1), *Cassia* (1), *Chrysanthemum* (2), *Convolvulus* (1), *Coreopsis* (1), *Daviesia* (1), *Dichopogon* (2), *Dillwynia* (2), *Diplotaxis* DC. (1), *Echinops* (1), *Eucalyptus* (8), *Grevillea* (1), *Helichrysum* (4), *Helipterum* (1), *Hibbertia* (1), *Hypochoeris* (3), *Lavatera* (2), *Leptospermum* (1), *Medicago* (1), *Melaleuca* (2), *Microseris* D. Don. (2), *Myoporum* (1), *Orthrosanthus* Sweet (1), *Oxalis* (1), *Pachylepis* Less. (1), *Papaver* L. (1), *Persicaria* Mill. (1), *Persoonia* (1), *Pultenaea* (1), *Ranunculus* (3), *Rapistrum* (1), *Rubus* L. (2), *Scabiosa* L. (2), *Scaevola* (1), *Schinus* (1), *Senecio* (1), *Taraxacum* (4), *Thelymitra* (1), *Thymus* (1), *Wahlenbergia* (10), *Westringia* (1), *Xanthorrhoea* (2).

Flight Phenology.

63	30	23	8	2	0	1	3	26	60	90	62
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Cockerell (1913b: 597) suggested that *Halictus lanarius* and *H. lanuginosus* were "apparently the same". Although I confirm the synonymy, I do not consider that Cockerell's note constituted a valid synonymy.

No intraspecific variation is present within the species despite its the broad distributional range. The diversity of forage records for *L. lanarium* suggests the species plays a major role in pollination of native plants in the Bassian province.

The ratio of collected males to females of *L. lanarium* and *L. soror* is unusually high. *Lasioglossum lanarium* and *L. soror* are the only species in which significantly more males have been collected than females (363♀♀:714♂♂ and 293♀♀:451♂♂ respectively). There is no evidence to suggest that unusual collecting techniques were employed to collect these two species. Indeed, the specimens of *L. lanarium* represent 396 independent catches and for *L. soror*, 146 catches. *Lasioglossum bubrachium* is the only other species with a considerably higher catch of males than females. However, this can be explained by the author's collecting of 47 males at a single site. A possible explanation for the unusual sex ratios is that males and females of these species the sexes meet mainly at blossoms rather than at nesting sites.

There are three envenomation records for *Lasioglossum lanarium* (SA, Leeton and Kadina; Tas, New Town). Two of these stings required hospitalisation of the victim, with one producing an anaphylactic reaction.

Lasioglossum (Chilalictus) latichilum sp. nov.

Figures 107A–D

Material examined. Holotype. ♀, South Australia, Martins Well, 90 km NE of Hawker (31°29′S, 139°07′E), 26 Oct 1990, KLW, on *Eremophila* (NMV T-15618).

Paratypes. 5♀♀, same data as holotype (NMV T-15619–15623).

Diagnosis. Most like *L. xerophilum*. Female with head and mesosoma black, metasoma brown with posterior marginal areas of tergites, frons finely punctate, labrum distal process broad, median keel not reaching distal margin, mesoscutum mesially densely punctate, closely to densely punctate in parapsidal areas, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae.

Description of female (male unknown). Body length 4.77–5.16 mm ($\bar{x}$=4.96 mm, SD=0.11, n=6), head width 1.48–1.53 mm (n=6), forewing length 1.22–1.29 mm ($\bar{x}$=1.25 mm, SD=0.03, n=6). Relative dimensions: HW 100, HL 86–88, UID 62–63, LID 55–56, AOD 20–21, IAD 13–14, OAD 31–32, IOD 25–26, OOD 14–15, CL 20–21, GW 17–18, EW 25–26, SL 33–35, FL 62–64.

Structure. Head elongate, triangular, inner orbits converging below, median frontal carina not reaching median ocellus, eyes with a sparse cover of minute setae. Scape just short of reaching anterior margin of median ocellus. Clypeus short (CL 0.36 × LID), convex along ventral margin, surface smooth and shining, basal two-thirds almost impunctate, though with a few minute, shallow punctures, openly punctate along anterior margin with similar punctures, supraclypeal area almost flat, shining, openly punctate with minute punctures. Frons (fig. 107A) finely punctate, above antennal bases, with small, shallow punctures, mesially openly punctate, laterally densely punctate, sculpture extends vertically continues onto vertex. Labrum (fig. 107B) basal median area raised forming two large tubercles, lateral margins reeessed, anterior margin obtuse, distal process almost square, not tapered, slightly wider at base, median keel weak, not reaching distal margin restricted to basal half of process, lateral ridges absent, setae not present across distal margin, setae originating in from margin by distance greater than diameter of seta, lateral teeth small, thickened, not distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 107C) anterior margin rounded, punctation moderately coarse, surface with a dull sheen, anteriorly impunctate, mesially densely punctate, with small rounded punctures, closely to densely punctate in parapsidal areas with smaller punctures. Scutellum 1.3 × longer than dorsal surface of propodeum, surface polished, sparsely punctate with minute punctures except dull along midline and closely to densely punctate with slightly larger punctures. Dorsal surfaee of propodeum (fig. 107C) defined by posterolateral carinae set well below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate, almost extends to dorsal rim, rim smooth, shining, gently rounded. T1 densely punctate. Mesepisternum and metepisternum smooth and shining. BP broadly rounded.

Colour. Head and mesosoma black, metasoma brown with posterior marginal area of tergites light brown (giving weakly banded appearanee), mandibles light brown, dark red-brown apically, antennal flagellum light brown underneath, legs with tibiae and tarsi light red-brown except mid and hind tibiae suffused with brown mesially, remainder of legs brown.

Vestiture. Body with conspicuous cover of hair, lower frons (fig. 107A), paraocular areas and genae with dense cover of short, adpressed, minutely branched hair forming a mat, similar hair on lateral margins of mesosoma, mesoscutum with tomentum of hair around lateral and posterior margins, metanotum with tomentum, metasomal tomentum well developed laterally on T2, aeross T3 and T4.

Distribution (fig. 107D). Southeastern South Australia.

Etymology. The epithet *latichilum* means "broad lip" and refers to the shape of distal process on the labrum.

Floral Forage Record. Family visited = 1. Catch total = 1; Myoporaeeae (1 catch). Genus visited, *Eremophila* (1).

Flight Phenology.

0	0	0	0	0	0	0	0	0	1	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Parsimony analysis (Walker, 1994), using female characters alone, placed *L. latichilum* within a species-group which includes *L. abrophilum*, *L. caesium*, *L. clypeatum*, *L. frankenia* and *L. megacephalum*. The synapomorphies of species-group are mainly labrum characters.

Lasioglossum (Chilalictus) lineatum sp. nov.

Figures 14F, 108A–D

Material examined. Holotype. ♀, New South Wales, 12 km ESE of Conargo (35°22′S, 145°19′E), 17 Apr 1978, JCC (ANIC, missing right flagellar segments.)

Paratypes (3♀♀). New South Wales: 1♀, 6 km S of Mungindi (28°59′S, 149°00′E), 15 Sep 1988, N.W. Rodd (RODD); 1♀, 7 km W of Walgett (30°01′S, 148°05′E), 15 Sep 1988, N.W. Rodd (RODD); 1♀, same data as holotype (ANIC).

Diagnosis. Like *L. bibrochum*. Female with body black, frons finely punctate/striate, mesoscutum shining, closely punctate mesially, densely punctate in parapsidal areas, along midline area finely striate, dorsal surface of propodeum ruguloso-striolate not defined by carinae.

Description of female. (male unknown). Body length 5.85–6.31 mm ($\bar{x}$ = 5.98 mm, SD = 0.22, n = 4), head width 1.69–1.74 mm (n = 4), forewing length 1.72–1.79 mm ($\bar{x}$ = 1.75 mm, SD = 0.03, n = 4). Relative dimensions: HW 100, HL 83–85, UID 60–62, LID 56–57, AOD 19–20, IAD 12–13, OAD 27–28, IOD 19–20, OOD 13–14, CL 20–21, GW 16–17, EW 25–26, SL 39–40, FL 71–74.

Structure. Head broad though distinctly triangular, inner orbits converging below, median

frontal carina extends to median ocellus, upper half weak, eyes with sparse cover of minute setae. Scape reaching reach at least anterior margin of median ocellus. Clypeus short (CL 0.37 × LID), convex basally, surface shining, closely to densely punctate with small, rounded shallow punctures, supraclypeal area slightly raised and shining mesially, remainder dull, closely punctate. Frons (fig. 108A) finely punctate, above antennal bases, with punctures aligned to form fine striae, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 108B) median basal area weakly raised, sparsely nodulated, lateral areas weakly recessed, distal process not widest at base, weakly flanged distally, median keel extends to distal margin, lateral ridges weak, not reaching margin, setae not present across margin, lateral teeth large, weakly hooked distally. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 108C) anterior margin rounded, surface shining except anteriorly and along midline, anteriorly impunctate, closely punctate mesially, densely punctate in parapsidal areas, along midline area finely striate, striae extend to posterior margin, punctures between striae slightly elongated. Scutellum 1.18 × longer than dorsal surface of propodeum, surface shining, sparsely punctate. Dorsal surface of propodeum (fig. 14F) not defined by carinae, posterovertical carinae extends beyond half-way to dorsal level, dorsal sculpture rugulose-striolate with a few striae laterally, sculpture not reaching dorsal rim, rim dull, gently curved onto vertical surface. Metasomal T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum finely striate. BP rounded.

Colour. Head and mesosoma black, metasoma and legs brown, mandibles red-brown apically, antennal flagellum light brown underneath.

Vestiture. Body sparse, frons with simple erect and minutely branched hair, lower paraocular areas with some short, adpressed, plumose hair, mesoscutum with sparse cover of short hair, mesoventral area hair simple, metasomal tomentum laterally on T2, across T3 and T4.

Distribution (fig. 108D). Inland New South Wales.

Etymology. The epithet *lineatum* refers to the striate lines on the mesoscutum.

Floral Forage Record. None available.

Flight Phenology.

0	0	0	1	0	0	0	0	2	0	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The relationships of this species remain unresolved. Based on the shape and sculpture of the head and propodeum, the species appears to belong to the "*Wahlenbergia* bee" species-group.

Lasioglossum (Chilalictus) litovillum sp. nov.

Figures 13B, 109A–H

Material examined. Holotype. ♀, Tasmania, Eaglehawk Neck (43°02′S, 147°55′E), 15 Jan 1949, E.F. Riek (ANIC).

Paratypes (34♀♀, 8♂♂). New South Wales and Australian Capital Territory: 1♀, Mt Kaputar Nat. Pk (30°04′S, 150°04′E), 11 Jan 1978, G. Daniels (AM); 1♀, Mt Kaputar Nat. Park, 58 km E of Narrabri (30°04′S, 150°04′E), 2 Dec 1976, EME & T. Low (UQIC); 3♂♂, Mt Kaputar Nat. Pk (30°04′S, 150°04′E), 11–13 Nov 1979, N.W. Rodd (RODD); 1♀, Lindsay Tops, Mt Kaputar Nat. Pk (30°17′S, 150°11′E), 1420m, 5 Dec 1987, G.R. Brown, in eucalyptus forest and heath (BCR1; missing head); 2♀♀, Dawsons Springs, Mt Kaputar Nat. Pk (30°17′S, 150°10′E), 1420m, 30 Nov–10 Dec 1987, G.R. Brown, trigger plant pollinator (BCR1); 1♀, nr Euglah Cave, Mt Kaputar Nat. Pk (30°18′S, 150°09′E), 1120m, 7 Dec 1987, G.R. Brown, in eucalyptus forest (BCR1); 1♀, Ebor (30°24′S, 152°21′E), 1 Jan 1916 (QM T13582); 5♀♀, New England Nat. Pk, near entrance (30°53′S, 153°01′E), 29 Nov 1960, C. Frazier (ANIC); 2♀♀, Tubrabucca (31°53′S, 151°25′E), 10–23 Jan 1948, R.T.M.P. & A.N.B (NMV T-15624–15625); 1♀, Barrington Tops (31°59′S, 151°27′E), 20 Jan 1928, T.G. Campbell (AM); 1♀, 1♂, Clarence (33°29′S, 150°14′E), 22 Oct 1982, 30 Dec 1982, N.W. Rodd (RODD); 1♀, Blackheath (33°38′S, 150°17′E), 24–27 Jan 1948, R.T.M. & A.N.B (NMV T-15626); 1♀, Centravale (33°53′S, 151°12′E), 10 Jan 1948, R.T.M.P. & A.N.B (NMV T-15627); 1♀, Galong Ck (34°36′S, 148°34′E), 14 Nov 1944 (AM); 1♀, 26 mi from Goulburn (34°45′S, 149°43′E), 8 Jan 1967, JCC, on *Wahlenbergia* (UQIC); 1♂, Piccadilly Circus, Brindabella Ra. (35°22′S, 148°48′E), 24 Nov 1981, JCC (ANIC); 1♀, Piccadilly Circus (35°22′S, 148°48′E), 1240m, Jan 1984, J. Lawrence, T. Weir, Johnson coll. flight intercept window/trough trap (ANIC); 1♀, Monga, Clyde Mt (35°33′S, 149°57′E), 25 Nov 1952, S.J. Paramonov (ANIC); 1♀, Alpine Creek, Kiandra (35°54′S, 148°35′E), 16 Jan 1968, JCC (ANIC; gold coated); 1♀, Woodlot 2, Bondi State Forest (37°08′S, 149°23′E), 3 Jan 1980, D.S. Kent (AM).

Victoria: 2♂♂, Mitta Mitta River, 8 km NW of Darmouth Dam (36°32′S, 147°27′E), 1 Nov 1976, A.A. Calder (NMV T-15628–15629); 1♀, Warburton (37°45′S, 145°42′E), 9 Dec 1918 (NMV T-15630); 1♀, Ringwood (37°49′S, 145°14′E), 1 Dec 1915, Spry (NMV T-15631); 1♂, Victoria, 7 Feb 1907, Turner

Coll. 1912-111 (BMNH); 1♀, Belgrave (37°55′S, 145°21′E), 2–3 Dec 1930, C.B (SAM; missing head); 2♀♀, Aura (37°56′S, 145°23′E), Feb 1933, S. Butler (NMV T-15632–15633); 1♀, Sandringham (37°57′S, 145°00′E), Nov 1934 (ANIC); 1♀, Wilsons Promontory (38°56′S, 146°22′E), 19 Oct 1957, E.M (NMV T-15634).

Tasmania: 1♀, 1 km E of by N Herrick (41°06′S, 147°52′E), 29–30 Jan 1983, IDN & JCC, on *Leptospermum* (ANIC); 1♀, Derby (41°09′S, 147°48′E), 10 Jan 1949. E.F. Riek (ANIC; head, labrum, right hind leg on separate minuten pins); 1♀, Launceston (41°26′S, 147°08′E), 25 Dec 1916, F.M. Littler (SAM; head detached and glued to pith.)

Other specimens examined (1♀, 7♂♂). New South Wales: Guyra, Mt Kaputar Nat. Pk, Piccadilly Circus (Brindabella Ra.)

Victoria: Darmouth Dam, Grampians.

Diagnosis. Most like *L. repraesentans*. Both sexes with body black. Female with frons reticulate, mesoscutum anterior margin with bilobed mesial projection, surface shining, punctation moderately coarse, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral angular carinae, dorsal rim rounded, weakly raised mesially. Male with antennae moderately long, S2–S5 with long posteriorly directed stiff hair, hair on S2 weakly branched; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 8.86–10.40 mm ($\bar{x}$=9.62 mm, SD=0.45, n=10), head width 2.54–2.70 mm (n=10), forewing length 2.28–2.75 mm ($\bar{x}$=2.55 mm, SD=0.13, n=10). Relative dimensions: HW 100, HL 85–86, UID 59–60, LID 51–53, AOD 20–21, IAD 7–8, OAD 24–25, IOD 16–17, OOD 16–17, CL 20–22, GW 17–20, EW 23–25, SL 42–43, FL 73–75.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes with short, sparse setae. Scape reaching posterior margin of lateral ocelli. Clypeus short (CL 0.42 × LID), convex basally, surface shining except along anterior margin dull, coarsely punctate, basally punctures deeply impressed and elliptical, along anterior margin punctures round small and densely punctate, supraclypeal area weakly protruded, shining mesially, closely punctate. Frons (fig. 109A) coarsely reticulate above antennal bases, less so laterally, sculpture extends to anterior margin of lateral ocelli. Labrum (fig. 109B) basal median area raised, relatively smooth, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges weak, not reaching margin, distal margin setose, lateral teeth large, distally hooked. Pronotum dorsolaterally rounded, projected. Mesoscutum (fig. 109C) anterior margin with bilobed, mesial projection, surface shining, punctation moderately coarse, along midline and parapsidal areas dense, between midline and parapsidal lines openly to closely punctate. Scutellum 1.33 × longer than dorsal surface of propodeum, surface shining, weakly concave and densely punctate along midline, remainder sparsely punctate. Dorsal surface of propodeum (fig. 109C) defined by posterolateral angular carinae set well below dorsal surface, posterovertical surface transversely plicate, carinae reach dorsal carinae, dorsal rim rounded, weakly raised mesially, sculpture ruguloso-striolate mesially, striate laterally, sculpture reaches rim. T1 densely punctate. Mesepisternum and metepisternum striate; BP rounded.

Colour. Body black except flagellum segments underneath, legs and anterior margin of sternites dark brown.

Vestiture. Body sparse, head and mesoscutum with erect, branched hair, white tomentum lateral on T2, across T3 and T4.

Description of male. Body length 7.85–8.70 mm ($\bar{x}$=8.34 mm, SD=0.36, n=5), head width 2.18–2.42 mm (n=5), forewing length 2.16–2.40 mm ($\bar{x}$=2.27 mm, SD=0.11, n=5). Relative dimensions: HW 100, HL 89–90, UID 60–62, LID 46–47, AOD 15–16, IAD 11–12, OAD 24–25, IOD 18–19, OOD 17–18, CL 21–22, GW 17–19, EW 29–30, ML 38–40, SL 32–33, FL 153–155.

Structure. Head broad, inner orbits converging below, eyes with sparse, minute setae; scape reaches median ocellus; clypeus flat, densely punctate, basal three-quarters dull yellow-white, supraclypeal area weakly produced, shining. Antennae moderately long (FL 1.72 × UID), AS4:AS2+3=1. Remainder of body and colour similar to female except propodeal dorsal rim not raised, posterolateral carinae not developed, BP obtuse; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Similar to female, paraocular hair erect, almost forming dense mat, weak tomentum on T2 and T3; S2–S5 with long posteriorly directed stiff hair, hair on S2 weakly branched, remainder simple.

Genitalia and associated sterna (figs 109E–H). Gonobase sides parallel, gonocoxite setose on apical inner margin, gonostyli setae long, both simple and branched, retrorse lobes sparsely setose, well developed, ventral flanges present, S8 median process truncate apically, with simple

setae simple, S7 median process elongate, apically pointed and setose.

Distribution (fig. 109D). Eastern zone of the Bassian province.

Etymology. The epithet *litovillum* means "simple hair" and refers to the vestiture on S3–S5 in males.

Floral Forage Record. Families visited=3. Catch total=5; Campanulaceae (1 catch), Myrtaceae (3), Stylidiaceae (1). Genera visited=4; *Eucalyptus* (2), *Leptospermum* (1), *Stylidium* Sw. ex Willd. (1), *Wahlenbergia* (1).

Flight Phenology.

11	2	0	0	0	0	0	0	0	3	8	8
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Several males, with weakly branched hairs across S3–S5, have been tentatively placed with *L. litovillum*. This placement is based on external morphological, genital and S7–S8 characters as well as coincident collection of these specimens, with males from the paratype series.

Lasioglossum (Chilalictus) littleri (Cockerell)

Figures 13C, 28F, 110A–H

Halictus littleri Cockerell, 1914e: 307.

Parasphecodes infrahirtus Cockerell, 1920: 118, syn. nov.

Halictus obscuripes Friese, 1924: 242 [junior primary homonym of *Halictus obscuripes* Friese, 1916; name not replaced] syn. of *infrahirtus* by Cockerell, 1929: 14.

Lasioglossum (*Chilalictus*) *littleri*. — Michener, 1965: 176.

Lasioglossum (*Chilalictus*) *infrahirtum*. — Michener, 1965: 176.

Material examined. Holotype of *littleri*. ♀, Tasmania, Launceston (41°26′S, 147°08′E), F.M. Littleri. 241c. USNM Type No. 27766 (USNM. missing left hind tibia and tarsal segments. Note that the published description cites 231c as the card number, examination of the type showed it to be 241c.).

Holotype of *infrahirtus*. ♂, Tasmania, Launceston (41°26′S, 147°08′E), 19 Sep 1916, F.M. Littler, 2799. USNM Type No. 27753 (USNM).

Syntype of *obscuripes*. ♂, South Australia, Adelaide (34°56′S, 138°36′E). 21 Sep 1906, Frank leg. (AMNH).

Other specimens examined (112♀♀, 11♂♂). Queensland: National Park.

New South Wales and Australian Capital Territory: Paddys River, Piccadilly Circus (Brindabella Ra.), Canberra, Brown Mt, Wentworth Falls, Mt Tomah, Blue Mountains National Park, Bathurst, Narooma, Tubrabucca.

Victoria: Gorae West, Cranbourne, Erica, Lakes Entrance, Mt Evelyn, Brisbane Ranges, Eltham, Coranderrk, Licola, Kinglake, Grampians, Merrijig, Gunbower.

Tasmania: Hastings, Longley, Mt Nelson, Mt Wellington, Frodsham Pass, Mt Mueller, Tyenna, Lake Fenton, Bronte Park, Franklin River, Queenstown, Henty Dunes, Corinna, Launceston, Hellyer Gorge.

South Australia: Meadows, Mt Lofty, North Glenelg, Athelstone, Birdwood, South Para Reserve, Melrose, Mt Remarkable, Kangaroo Island.

Diagnosis. Most like *L. teltiri*. Both sexes with body black. Female with frons striate, clypeus with deeply impressed irregular shaped punctures; labrum median keel spatulate; mesoscutal sculpture conspicuously coarse; dorsal surface of propodeum striate defined posterolaterally by carinae, dorsal rim raised and angular, recessed mesially. Male with S2–S3 with long erect plumose hair across sternite, S3 with lateral tufts; gonocoxal retrorse lobes glabrous; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 8.08–9.39 mm ($\bar{x}$=8.60 mm, SD=0.34, n=15), head width 2.31–2.49 mm (n=15), forewing length 2.35–2.70 mm ($\bar{x}$=2.53 mm, SD=0.11, n=15). Relative dimensions: HW 100, HL 82–84, UID 57–58, LID 52–53, AOD 20–21, IAD 10–11, OAD 24–25, IOD 14–15, OOD 15–16, CL 20–21, GW 18–20, EW 24–25, SL 45–46, FL 80–81.

Structure. Head broad, inner orbits converging below, median frontal carinae reaches median ocellus, eyes with sparse minute setae. Scape reaching at least anterior margin of lateral ocelli. Clypeus short (CL 0.39 × LID), almost flat except convex basally, surface dull more so anteriorly, basally and mesially coarsely roughened with large deeply impressed irregular shaped punctures, some elliptical, punctures almost contiguous, anteriorly with small rounded shallow punctures, openly to closely punctate, supraclypeal area dull, protruded mesially, punctation and surface sculpture similar to clypeus anteriorly. Frons (fig. 110A) coarsely striate, above antennal bases, with interconnectives giving partially reticulate pattern, sculpture less coarse laterally, extends vertically to posterior margin of lateral ocelli. Labrum (fig. 110B) basal area median area raised, sculpture roughened, distal process not tapering, widest at base, median keel spatulate distally extends almost to setose distal margin, lateral ridges present, lateral teeth large, some hooked. Pronotum dorsolateral angles bluntly obtuse, well projected. Mesoscutum (fig. 110C) anterior margin with bilobed, mesial projection,

sculpture conspicuously coarse, surface dull except some specimens with posteromesial area shining, anteromesially with fine transverse lines, anterolaterally reticulate, remainder densely punctate with mesoscutal punctation large deeply impressed punctures except posteromesially openly to closely punctate with smooth interspaces. Scutellum 1.19 × longer than dorsal surface of propodeum, concave along midline, surface shining and smooth, sparsely punctate except along midline and margin densely punctate. Dorsal surface of propodeum (fig. 13C) defined posterolaterally by carinae set well below dorsal level, posterovertical surface plicate, carinae reach dorsal carinae, dorsal surface dull, fine reticulate, sculpture striate to ruguloso-striolate mesially to striate laterally, sculpture reaches rim laterally, dorsal rim raised and angular, recessed mesially. T1 densely punctate, metasoma shining. Mesepisternum and metepisternum striate. BP broadly rounded.

Colour. Body black with metasoma shining ebony, mandibles red-brown apically, tarsi dark brown.

Vestiture. Body sparse, paraocular areas with erect branched white hair, frons with erect minutely branched dark brown hair, mesoscutum with similar shorter hair, white lateral tomentum on T2, across T3 and T4.

Description of male. Body length 7.08–7.93 mm ($\bar{x}$=7.47 mm, SD=0.31, n=5), head width 1.97–2.23 mm (n=5), forewing length 1.95–2.28 mm ($\bar{x}$=2.14 mm, SD=0.12, n=5). Relative dimensions: HW 100, HL 82–84, UID 59–61, LID 44–45, AOD 17–18, IAD 12–13, OAD 23–25, IOD 17–18, OOD 16–18, CL 19–20, GW 17–18, EW 31–32, ML 37–38, SL 31–33, FL 140–143.

Structure. Head broad, inner orbits converging below, eyes wide in side view (EW 1.8 × GW) with sparse minute setae; clypeus flat, shining except anteriorly dull, longitudinal shallow grooves on basal half, basal three-quarters white/yellow, supraclypeal area weakly protruded, indistinctly punctate, frons coarsely reticulate. Antennae distinctly long (FL 2.34 × UID), AS4:AS2+3=1. Mesoscutum smooth and shining mesially, sculpture less coarse than female, mesially sparsely to openly punctate, laterally closely punctate, all punctures rounded and shallow; dorsal propodeal posterolateral carinae weak, dorsal sculpture strong, ruguloso-striolate mesially; metasomal terga shining, T1 openly to sparsely punctate; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Paraocular areas with erect branched hair not dense enough to form mat, long hairs on genae, scutellum and metanotum, weak lateral tomentum on T2, mesoventral area with dense plumose hair forming a mat; S2 and S3 with long erect plumose hair across sternite, S3 hair laterally longer than mesially forming lateral tufts, S4 and S5 with short simple adpressed posteriorly directed hair except S4 with weak lateral hair tufts (fig. 28F).

Genitalia and associated sterna (figs 110E–H). Gonobase sides narrowed basally, gonocoxite setose on apical inner margin, gonostyli setae long and simple along entire length, retrorse lobes well developed, glabrous, ventral flanges present and distinctly wrinkled, S7–S8 median proecesses apically pointed, with simple setae.

Distribution (fig. 110D). Known from the eastern zone of the Bassian province.

Floral Forage Record. Families visited=8. Catch total=16; Aizoaceae (1 catch), Fabaceae (5), Myrtaceae (3), Pittosporaceae (1), Proteaceae (2), Rosaceae (2), Scrophulariaceae (1), Xanthorrhoeaceae (1); Genera visited=12; *Acacia* (3), *Calytrix* (1), *Cheiranthera* (1), *Cotoneaster* (2), *Dillwynia* (1), *Eucalyptus* (2), *Grevillea* (1), *Hakea* (1), *Mesembryanthemum* (1), *Parahebe* W.R.B. Oliv. (1), *Platylobium* (1), *Xanthorrhoea* (1).

Flight Phenology.

15	4	1	3	0	0	0	1	1	22	15	15
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum littleri is the sister taxon of *L. teltiri* and may be separated by the presence of propodeal carinae in both sexes (absent in *L. teltiri*) and different male pubescence on S3 and S4 (Walker, 1994). These two species may represent an example of recent allopatric speciation. The two taxa are allopatric and occur in the western and eastern zones of the Bassian province. Although the taxa are currently allopatric, they may have originally been a single species with a continuous gene flow from west to east. The continuity of that gene flow may have been broken by a barrier, such as the arid Nullarbor Plain, which arose during the cyclic climatic changes (Bowler, 1982) that occurred in the past 25,000 years. The species was divided into two populations which have now diverged morphologically sufficiently to warrant specific status for each population.

Three specimens have large mites (two with a

single mite, one with two mites) attached to either the vertical surface of the propodeum and between the second and third coxae.

Lasioglossum (Chilalictus) macrops (Cockerell)

Figures 111A–H

Halictus macrops Cockerell, 1916b: 373.
Lasioglossum (*Chilalictus*) *macrops*. — Michener, 1965: 176.

Material examined. Holotype. ♂, Tasmania, Launceston (41°26′S, 147°08′E), F.M. Littler collection, 2323, BM Type Hym 17.a.947 (BMNH, glued to card, missing right antenna and last eight flagellar segments of the left antenna.)

Other material examined (2♀♀, 6♂♂) Australian Capital Territory: Cotter River.
Victoria: Melbourne.
Tasmania: Hobart, Launceston.

Diagnosis. Most like *L. bidens*. Both sexes black with metasoma suffused with black. Female with frons striate, mesoscutum dull, openly to closely punctate, mesoventral area with hair branched on anterior side of shaft only, dorsal surface of propodeum ruguloso-striolate, not defined by carinae. Male with clypeus black, antennae short (FL 1.1 × UID), AS4:AS2+3=0.4, lower frons, paraocular areas, clypeus and supraclypeal areas covered with dense, white mat of hair, sternal vestiture sparse, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 5.08–5.16 mm (n=2), head width 1.50–1.53 mm (n=2), forewing length 1.41–1.43 mm (n=2). Relative dimensions: HW 100, HL 81–82, UID 66–67, LID 54–55, AOD 19–20, IAD 12–13, OAD 28–29, IOD 19–20, OOD 20–21, CL 19–20, GW 17–18, EW 27–28, SL 35–37, FL 66–69.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, upper half of carina weak, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.36 × LID), convex ventrally, basally with a dull sheen, openly punctate with large, deeply impressed punctures, anteriorly dull with fine transverse lineolation, sparsely to openly punctate with small, shallow rounded punctures. Frons (fig. 111A) striate/punctate above antennal bases, sides of punctures aligned, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 111B) basal median area raised and weakly nodulated, anteriorly nodules joined forming weak ridges, anterior margin rounded mesially, distal process not widest at base, flanged distally, median keel extends to distal margin, slightly spatulate distally, lateral ridges short, serrate, near distal margin, setae not present across margin, distal setae originate submarginally, lateral teeth large, distally hooked. Pronotum dorsolateral angles rounded, well projected. Mesoscutum (fig. 111C) anterior margin with weak, rounded mesial projection, punctation moderately coarse, anteriorly dull and impunctate, along midline, posterior margin, laterad of parapsidal lines closely punctate, mesially sparsely to openly punctate. Scutellum 1.3 × longer than dorsal surface of propodeum, surface dull, closely punctate. Dorsal surface of propodeum (fig. 111C) not defined by carinae, posterovertical carinae extend less than half-way to dorsal level, dorsal sculpture ruguloso-striolate with a few weak striae laterally, sculpture not reaching dorsal rim, rim dull, gently curved to vertical surface. T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum finely striate. BP rounded.

Colour. Head and mesosoma black, metasoma suffused with brown, posterior marginal areas of tergites light brown, mandibles dark red-brown apically, legs light brown.

Vestiture. Body sparse, paraocular areas with some long, branched hair, frons with short, simple or weakly branched hair, mesoscutum with short, adpressed simple and sparse erect, branched hair, mesoventral area with hair branched on anterior side of shaft only, metasomal tomentum laterally on T2, across T3 and T4, S2 and S3 hair plumose.

Description of male. Body length 5.16–5.62 mm ($\bar{x}$=5.36 mm, SD=0.17, n=6), head width 1.69–1.76 mm (n=6), forewing length 1.34–1.43 mm ($\bar{x}$=1.39 mm, SD=0.04, n=6). Relative dimensions: HW 100, HL 78–80, UID 67–68, LID 53–54, AOD 19–20, IAD 12–13, OAD 23–25, IOD 19–20, OOD 21–22, CL 19–20, GW 21–22, EW 25–26, ML 37–39, SL 31–33, FL 72–74.

Structure. Head broad, inner orbits converging below, eyes with a few minute setae, scape not reaching median ocellus, clypeus black to dark brown, surface shining, openly punctate basally, anteriorly and supraclypeal area densely punctate, latter flat. Antennae short (FL 1.1 × UID), AS4:AS2+3=0.4. Remainder similar to female except frons coarsely striate, dorsolateral angles of pronotum weakly projected, mesoscu-

tum shining but dull anteriorly, mesially closely punctate, scutellum shining, sparsely to openly punctate, dorsal sculpture of propodeum striolate; colour similar to female; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Head with lower frons, paraocular areas, clypeus and supraclypeal areas covered with dense, white, adpressed, plumose hair forming a mat, mesoscutum with moderate cover of erect, branched hair, mesoventral area with plumose hair, metasomal tomentum laterally on T2 and T3; sternal vestiture sparse, S2–S4 with some erect, minutely branched hair, S5 and S6 with short, adpressed simple hair.

Genitalia and associated sterna (figs 111E–H). Gonobase sides slightly narrowed basally, gonocoxite with apical inner margin setose, gonostyli long, slightly flanged apically, with long hair on upper surface, short hair on lower surface, penis valves outer dorsoapical margins flanged, retrorse lobes setose, weakly developed, ventral flanges absent; S8 median process short, apically rounded, with setae apically and on lateral margins, S7 median process rounded, glabrous.

Distribution (fig. 111D). Eastern zone of the Bassian province.

Floral Forage Record. None available.

Flight Phenology.

3	0	0	0	0	0	0	0	0	2	0	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Few specimens of this species are known. It has not been recorded since 1953 and may now be extinct.

Lasioglossum (Chilalictus) mediopolitum (Cockerell)

Figures 29C, 112A–H

Halictus mediopolitus Cockerell, 1914a: 518.
Lasioglossum (Chilalictus) mediopolitum. — Michener 1965: 176.

Material examined. Syntypes (2♀♀). ♀, South Australia, Purnong near Murray Bridge (34°51′S, 139°38′E), 8 Mar 1912, S.W. Fulton, 136 ("Type" in Cockerell's handwriting), USNM Type No. 27727 (USNM, head and metasoma glued to the card, right flagellum missing distal segment, both fore legs and left hind tibia and tarsi glued to card); ♀, same data as above, but lacking "136", "Cotype" in Cockerell's handwriting (NMV T-10394. Cockerell's description lists three specimens but only two have been located.)

Other specimens examined (434♀♀, 183♂♂). New South Wales and Australian Capital Territory: Euston, Mildura, Wentworth, Willandra Nat. Pk, Kinchega Nat. Pk, Broken Hill.

Victoria: Horsham, Kiata, Warracknabeal, Kerang, Ouyen, Robinvale.

South Australia: Box Flat, Finniss, Purnong, Port Lincoln, Swan Reach, Cummins, Truro, Renmark, Mingaroo, Kimba, Middleback Range, Whyalla, Morganvale, Lake Gilles Nat. Pk, Lake Gilles Nat. Pk, Minnipa, Mt Remarkable, Wilmington, Gawler Ranges, Yunta, Thurgla, Wirrulla, Cummins, Ceduna, Penong, Nundroo, Wilpena, Eucla, Wilpena.

Western Australia: Grass Patch, Salmon Gums, Lake King, Hatter Hill, Norseman, Lake Cronin, McDermid Rock, Higginsville, Eucla, Merredin, Yellowdine, Boorabbin Rock, Dedari, Coolgardie, Koolyanobbing, Broad Arrow.

Diagnosis. Most like *L. nefrens*. Both sexes with body black. Female with frons striate, labrum basal median area verruculose, mesoscutum surface smooth and shining sparsely to openly punctate, dorsal surface of propodeum rugulosostriolate, defined by posterolateral carinae. Male with antennae long, S2 and S3 with long plumose hair across sterna, S4 with long plumose hair across sternite except mesially hair shorter; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 5.54–6.39 mm ($\bar{x}$=5.92 mm, SD=0.28, n=10), head width 1.62–1.76 mm (n=10), forewing length 1.60–1.81 mm ($\bar{x}$=1.70 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 78–80, UID 58–59, LID 55–57, AOD 21–22, IAD 10–11, OAD 25–26, IOD 20–21, OOD 12–15, CL 18–19, GW 18–19, EW 25–26, SL 40–41, FL 83–85.

Structure. Head broad, inner orbits weakly converging below, median frontal carina reaches median ocellus, anterior portion of carina weakly developed. Scape reaches at least anterior margin of lateral ocelli. Clypeus and supraclypeal area smooth and shining, clypeus weakly convex, openly to closely punctate with shallow punctures, anterior margin smooth, supraclypeal area protruded, openly to closely punctate. Frons (fig. 112A) striate above antennal bases, sculpture laterally almost smooth, extends vertically beyond onto vertex. Labrum (fig. 112B) basal median area raised, verruculose, distal process not tapered, widest at base, median keel narrow, extends to distal margin, lateral ridges weakly serrate, not reaching margin, setae not present across entire distal margin, lateral distal setae originate in from margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles rounded, weakly projected. Mesoscutum (fig. 112C) anterior margin rounded, entire surface smooth and shining brilliantly, sparsely to openly punctate with weak, shallow punctures mesially, closely punctate in

parapsidal areas. Scutellum length equal to dorsal surface of propodeum length, weakly concave and closely punctate along midline, remainder smooth, shining and sparsely punctate. Dorsal surface of propodeum (fig. 112C) defined by posterolateral carinae set just below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture closely rugulosostriolate mesially, striolate at lateral margins, sculpture not reaching rim, dorsal rounded and shining. T1 densely punctate. Mesepisternum closely striate, metepisternum dull, weakly striate. BP broadly rounded.

Colour. Body black with a high lustre; mandibles red-brown apically, antennal flagellum underneath brown, metasoma and legs black tinged with brown.

Vestiture. Body sparse, face with short, erect weakly branched hair, genae with white adpressed hair, mesoscutum almost glabrous except thin line of tomentous hair along posterior margin, strong tomentum across T2–T4.

Description of male. Body length 4.31–5.00 mm ($\bar{x}$=4.74 mm, SD=0.20, n=10), head width 1.36–1.48 mm (n=10), forewing length 1.29–1.53 mm ($\bar{x}$=1.42 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 81–83, UID 60–61, LID 43–45, AOD 15–16, IAD 15–16, OAD 24–25, IOD 23–24, OOD 14–15, CL 20–21, GW 16–17, EW 32–33, ML 35–37, SL 30–31, FL 137–140.

Structure. Head broad, inner orbits converging below, orbits prominent in dorsal and lateral views, with sparse cover of minute setae, scape reaches anterior margin of anterior ocellus, clypeus flat, at least basal half yellow-white, clypeus, supraclypeal area and mesosoma shining brilliantly. Antennae long (FL 2.29 × UID), AS4:AS2+3=1. Remainder of body similar to female except pronotal dorsolateral angles almost absent, dorsal surface of propodeum posterolateral carinae weak to absent; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Paraocular areas with dense, short, adpressed and erect plumose hair, lower paraocular area hair forming mat, clypeus and supraclypeal area sparse, anterior margin of mesoscutum hirsute, not forming tomentum as in female, metasoma without tomentous areas. S2 and S3 with long plumose hair across sterna, S4 vestiture with lateral plumose longer than mesial hairs or in some specimens mesial area glabrous (fig. 29C).

Genitalia and associated sterna (figs 112E–H). Gonobase flanged basally, gonocoxite with several elongate setae on apical inner margin, gonostyli with long simple apically, retrorse lobes glabrous except several setae on anterior margin, well developed, ventral flanges present; S8 and S7 median process rounded, S8 with simple setae apically, S7 glabrous.

Distribution (fig. 112D). Southern Eyrean province following the floral distribution of the "mallee" (*sensu* Carnahan and Deveson, 1990).

Floral Forage Record. Families visited=8. Catch total=60; Anacardiaceae (1 catch), Dipsacaceae (1), Fabaceae (5), Myoporaceae (3), Myrtaceae (47), Proteaceae (1), Santalaceae (1), Sapindaceae (1): Genera visited=10; *Acacia* (5), *Atalaya* (1), *Eremophila* (3), *Eucalyptus* (41), *Eucarya* (1), *Grevillea* (1), *Melaleuca* (5), *Scabiosa* (1), *Schinus* (1), *Thryptomene* (1).

Flight Phenology.

10	8	4	6	1	0	0	0	11	30	12	3
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. This attractive looking species is one of the few black, non-metallic species found exclusively in the arid zone.

Lasioglossum (Chilalictus) megacephalum sp. nov.

Figures 6A–I, 7F, 9E, 10A–B, 17F, 20F, 21D, 28E, 113A–F, 114A–D

Material examined. Holotype. ♀, Western Australia, Coobarra Creek, 37k SW Tangadee HS (24°25′S, 118°56′E), 22.viii.1984, TFH & B.P. Hanich, 591-1, on flowers of *Goodenia berardiana* (WAM 87/430).

Paratypes (33♀♀, 26♂♂). Queensland: 1♀, Paroo River, Eulo (28°09′S, 145°02′E), 23 Sep 1991, G. Daniels & G. Maynard, on *Pluchea baccharoides* (UQIC); 1♀, Dynevor Lakes, 88 km W of Eulo (28°05′S, 144°12′E), 28 Sep 1991, 150m, G. Daniels & G.V. Maynard (UQIC).

New South Wales: 1♀, 17 km SW of Bourke (30°09′S, 145°52′E), 14 Dec 1976, EME & T. Low, on weeds (UQIC); 2♀♀, 2♂♂, 70 mi E Wilcannia (31°34′S, 143°52′E), 31 Jan 1971, TFH, on *Goodenia* (SAM); 2♀♀, Pooncarie (33°23′S, 142°34′E), 28 Nov 1992, N.W. Rodd (RODD).

South Australia: 2♀♀, 3♂♂, Oolgawa Waterhole (26°47′S, 135°53′E), 21 Apr 1977, TFH, on *Goodenia subintegra* (SAM); 3♀♀, Betty's Well, Everard Park Station (27°02′S, 132°26′E), 1–5 Nov 1970, TFH, on *Hibiscus farragei* (SAM); 1♀, 40 km NNE of Roxby Downs (30°22′S, 136°49′E), 31 Oct 1990, KLW, on *Morgania floribunda* (NMV T-15587).

Northern Territory: 1♂, 4 km N of Renner Springs (18°17′S, 133°48′E), 12 Dec 1974, EME & R.I. Storey, on *Eucalyptus setosa* (UQIC); 1♀, 2♂♂, 30 km WNW of Alice Springs (23°32′S, 133°38′E), 7 Oct 1978, JCC

(ANIC); 2♀♀, 1♂, 30 km S of Alice Springs (24°12′S, 133°52′E), 1 Nov 1974, EME & R.I. Storey, on *Calandrinia balonensis* and *Helichrysum bracteatum* (UQIC); 4♀♀, 6♂♂, same locality and collector, 3 Nov 1974, on *Scaevola parvifolia* (UQIC).

Western Australia: 1♀, Woljulum (15°50′S, 128°36′E), Sep 1955, A. Douglas (WAM 87/411); 1♀, 2♂, 186 km ESE of Broome (18°53′S, 123°43′E), 10 Aug 1976, I.F.B. Common (ANIC); 1♂, ca. 26 km SE of Kidson Bluff (22°16′S, 125°04′E), 5 Aug 1983, TFH & R.P. McMillan, on flowers of *Lechenaultia* (WAM 87/427); 2♂♂, Yampire Gorge, Hamersley Range (22°24′S, 118°28′E), 27 Aug 1971, TFH, on *Goodenia* (WAM 87/412, 87/413); 1♀, 1♂, Lake Cohen (24°26′S, 125°05′E), 5 Aug 1983, TFH & R.P. McMillan, on *Eremophila battii* (WAM 87/428, 429); 3♂♂, 30 km W of Mt Nossiter (25°25′S, 123°47′E), 31 Jul 1983, TFH & R.P. McMillan, on *Goodenia maideniana* (WAM 87/424–426); 1♀, 2 km WSW of Muggan RH, 156 km SW of Warburton (27°00′S, 125°19′E), 13–14 Sep 1982, B. Hanich & TFH, on *Eremophila gilesii* (WAM 87/414); 6♀♀, 3♂♂, 65 km NNE of Neale Junction (28°47′S, 126°07′E), 17–18 Sep 1982, B. Hanich & TFH, on *Velleia discophora* (WAM; ♀♀ 87/416, /417, /419, /420, /422, /423; ♂♂ 87/415, /418, /421); 1♀, Dedari (30°57′S, 121°09′E) (WAM 48/498).

Diagnosis. Unlike any other species, though macrocephalic head development of both sexes similar to *L. buccalum*. Macrocephalics present, head and proboscis modified, glossa and labial palps weakly elongated, measurements compared to HW (mean (SD), n=10), GL 0.56 (0.02) (female), 0.56 (0.02) (male); LPL 0.31 (0.01) (female and male); MPL 0.28 (0.01) (female and male); PML 0.77 (0.02) (female), 0.78 (0.02) (male). HL 0.87 (0.02) (female), 0.85 (0.03); hypostomal carina of proboscidial fossa flanged; pronotal dorsolateral areas grossly enlarged and elevated; mid coxal rim flanged apically, more so in male; first recurrent vein enters third submarginal cell; Female with fore basitarsi with elongate, basally thickened setae (0.78–0.94 mm, $\bar{x}$=0.85 mm, n=20); mandibular preapical tooth absent; male with labrum large as in female; mid and hind femora and hind tibia apically enlarged; distinctive vestiture on sterna S2–S4.

Description of female. Body length 6.54–8.47 mm ($\bar{x}$=7.49 mm, SD=0.49, n=10), head width 2.16–2.77 mm (n=10), forewing length 1.62–2.09 mm ($\bar{x}$=1.84mm, SD=0.11, n=10). Relative dimensions: HW 100, HL 85–89, UID 65–67, LID 65–70, AOD 19–20, IAD 18–19, OAD 25–28, IOD 17–17, OOD 18–20, CL 17–18, GW 23–24, EW 28–29, SL 28–29, FL 47–55.

Structure. Head (figs 6A, 6B) 0.87 × as long as wide, inner orbits parallel to diverging below, median frontal carina reaching approximately 0.5 to median ocellus; eyes sparsely covered with minute setae; malar space absent. Frons (fig. 113A) short and broad, 0.26 × HW, coarsely punctate, above antennal bases, punctures partly aligned forming striate pattern though not as distinct as supraclypeal area, sculpture extends to posterior margins of lateral ocelli, occiput punctate on anterior half, costulate on posterior half. Scape just reaching anterior margin of median ocellus, in some specimens not reaching. Labrum (fig. 113B) basal area lateral margins dorsally curved, anterior margin rounded and weakly protruded, median area forming two large tubercles, tubercles joined mesially, distal process broad, widest at base, lateral margins smooth, teeth absent, distal margin sinuate, lateral and distal setae present not originating along margin, insertion points in from margin at distance equal to half diameter of median ocellus, median keel present not reaching distal margin, lateral ridges absent. Clypeus short and broad, 3.6–4.1 × wider than long, about half lies below lower level of eyes, flat except weakly concave mesially, three projections along ventral margin (fig. 7F), mesially with single small, raised, roughened projection, laterally two rounded projections at lateral margins of labrum attachment, clypeus and supraclypeal area roughened except small smooth, shining area along midline of clypeus, remainder coarsely striate, ridges vertical. Proboscis modified (fig. 6A), glossa elongate, densely hirsute, labial palpi weakly elongate, measurements compared to HW (mean (SD), n=10), GL 0.56 (0.02), LPL 0.31 (0.01), MPL 0.28 (0.01), PML 0.77 (0.02), mandible without pre-apical tooth (fig. 113D). Genae (fig. 113C) broad 0.24 × HW, shining, weakly punctured on vertical surface, underneath surface costulate, lateroposterior margins of proboscidial fossa hypostomal carina flanged forming large, rounded projections (fig. 9E). Pronotum dorsolateral areas (figs 10A, 10B, 113E) enlarged and elevated, rounded except small angular protrusion on ventral margin, vertical pronotal surface with several prominent ridges extending length of surface. Mesoscutum (fig. 113E) narrower than HW, anterior margin with weakly bilobed mesial projection, punctation moderately coarse anteriorly and dense in parapsidal areas, punctures rounded, mesial and posterior sculpture similar to clypeal sculpture, punctures elongate to form coarsely striate pattern. Scutellum 1.2 × longer than dorsal surface of propodeum length, sculpture coarsely striate. Dorsal surface of propodeum

(fig. 113E) defined posteriorly by strong carinae, carinae well below dorsal level laterally and close to dorsal level mesially, posterovertical carinae strong, extend to meet dorsal surface carinae, dorsal surface sculpture weak, ruguloso-striolate except few striae laterally, sculpture not reaching dorsal rim, rim rounded, smooth. T1 densely punctured. Mesepisternum and metepisternum shining, weakly and indistinctly roughened. Fore tibial spur fan shaped, fore basitarsi with several large, stout, apically curved setae arising basally, setae reaching end of tarsal segment 4 (0.78–0.94 mm, $\bar{x}$=0.85 mm, n=20) (fig. 17F). BP rounded. Outer hind tibial spur and mid tibial spur curved distally. Mid coxae (cf. fig. 20F) with apical lobes extending over base of trochanters, trochanter basally recessed; first recurrent vein enters third submarginal cell, basal vein of third submarginal vein well selerotised to insertion point of first recurrent vein.

Colour. Head, pronotum, mesoscutum, scutellum, propodeum black; mandibles amber, dark red at apex, flagellum light brown, pronotal spiracle covers light brown, mesoscutum and propodeum with slight metallic, iridescent sheen, legs and metasoma light red-brown.

Vestiture. Lower frons and paraocular areas with dense, semi-adpressed, minutely plumose setae, upper frons and clypeus with erect, simple setae, genae and dorsolateral angles of pronotum densely covered with short, plumose setae; mesoscutum sparsely covered with simple setae, setae aligned towards parapsidal lines and follow parapsidal line direction, metanotum densely covered with setae; T1 with dense cover of short adpressed hair on basal half, lateral tomentum present on T2 and T3.

Description of male. Body length 6.08–7.55 mm ($\bar{x}$=6.73 mm, SD=0.45, n=10), head width 1.97–2.51 mm (n=10), forewing length 1.43–1.76 mm ($\bar{x}$=1.56 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 82–88, UID 65–68, LID 65–74, AOD 18–19, IAD 17–19, OAD 22–25, IOD 16–17, OOD 17–22, CL 15–18, GW 25–35, EW 23–28, ML 51–71, SL 27–28, FL 57–66.

Structure. Head features variable due to macrocephaly (figs 6C–H); head broad, 1.14–1.22 × wider than long; eyes parallel to diverging below; proboscis modified (fig. 6C), glossa, labial palpi as in female, measurements compared to HW (mean (SD), n=10), GL 0.56 (0.02), LPL 0.31 (0.01), MPL 0.28 (0.01), PML 0.78 (0.02), labrum large, basal area raised except deeply notched mesially, distal process similar to female except median keel absent (fig. 21D); proboscidial fossa with hypostomal carina flanged entire length; genae grossly enlarged in some specimens, forming large boss at lower ends of eyes (figs 6E, 6G), boss width equal to width of base of mandible; Antennae short (FL 0.83 × UID) in macrocephalies, equal to UID in normal males; AS4:AS2+3=0.33. Remainder similar to female but with clypeus shining, irregular shaped punctures not forming striate pattern; dorsolateral pronotal angles forming enlarged rounded angles, more so in macrocephalies; mesoscutum anterior margin bilobed, entire surface shining, punctation not dense, not forming striate ridges; mid coxae flanged and protruding over trochanters (fig. 20F); mid and hind femora enlarged mesially, hind tibia enlarged apically (fig. 28E), hind basitarsi thickened; colour similar to female except clypeus and mandibles cream/white; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Lower paraocular areas, supraclypeal area and frons covered in short adpressed, white, plumose hair; remainder of vestiture similar to female except T1 hair band weaker than female, fore basitarsi without elongated setae; sternal vestiture distinctive, mesial plumose hair tufts on S2–S4, with longest tufts on S2, and shortest tufts on S4, glabrous along midline of S3 and S4, hair directed posterolaterally on either side of midline on all sterna (figs 6I, 28E).

Genitalia and associated sterna (figs 114A–D). Gonobase sides flanged basally, gonocoxites with lateral and ventral setae, gonostyli long, with short simple and branched setae, apically with enlarged spine-like setae, retrorse lobes setose, well developed, ventral flanges absent; S8 median process rounded and setose apically, S7 median process broadly rounded with small spine-like setae.

Distribution (fig. 113F). Eyrean province.

Etymology. The epithet *megacephalum* means "large head" and refers to enlarged head found in both sexes.

Floral Forage Record. Families visited=7. Catch total=17; Compositae (2 catches), Goodeniaceae (8), Malvaceae (1), Myoporaceae (2), Myrtaceae (2), Portulacaceae (1), Scrophulariaceae (1); Genera visited=12; *Calandrinia* (1), *Eremophila* (2), *Eucalyptus* (1), *Goodenia* (5), *Helichrysum* (1), *Hibiscus* (1), *Lechenaultia* (1), *Melaleuca* (1), *Pluchea* Cass. (1), *Scaevola* (1), *Stemodia* (1), *Velleia* (1).

Flight Phenology.

1	0	0	1	0	0	1	5	5	2	6	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. All specimens of both sexes have some degree of macrocephaly. In the female, macrocephaly involves enlargement of the vertex and posterior genal areas. In males macrocephaly involves increases in: length of mandibles, divergence of the lower inner orbits, vertex length, genal areas (posterior and rounded process ventral to the mandibular articulation point), and dorsolateral pronotal enlargements and decreases in length of the antennal flagellum, eye and wing.

Terry Houston (personal communication) has suggested for, at least *L. megacephalum*, and possibly for *L. bucculum*, that the large headed species may usurp the nests of other bees. Knerer and Plateaux-Quenu (1967) described usurpation in halictine bees for *Halictus scabiosae* (Rossi). They suggested that females dispersing from spring associations either dig their own burrows or occupy those of other species, sometimes killing the owner and laying their eggs in cells already provisioned. The big head and odd-shaped labrum may be adaptations for combat with other burrowing bees or wasps. To date there are no field observations on *L. megacephalum* and *L. bucculum* to support this assertion.

Goodeniaceae is presumed to provide the major source of pollen for *L. megacephalum*. Members of this family store pollen in an indusium and I suggest that the elongated fore basitarsal setae are used to collect pollen from the indusium.

Lasioglossum (Chilalictus) melanopterum (Cockerell)

Figures 115A–H

Halictus melanopterus Cockerell, 1914d: 243.
Halictus spenceri Cockerell, 1916b: 368, syn. nov.
Lasioglossum (*Chilalictus*) *melanopterum*. — Michener, 1965: 177.
Lasioglossum (*Chilalictus*) *spenceri*. — Michener, 1965: 177.

Material examined. Holotype of *melanopterus*, ♀, Western Australia, Yallingup, near Cape Naturaliste (33°39′S, 115°01′E), 14 Sep–31 Oct, 1913, R.E. Turner, BM Hym Type 17.a.909 (BMNH, metasoma reglued to propodeum, missing head, hind tibiae and tarsi.).

Holotype of *spenceri*, ♂, Western Australia, Yallingup, near Cape Naturaliste (33°39′S, 115°01′E), 14 Sep–31 Oct, 1913, R.E. Turner, BM Hym Type 17.a.935 (BMNH).

Other specimens examined (7♀♀, 4♂♂). Western Australia: Cape Freyeinet, Conto Cliffs, Yallingup.

Diagnosis. Most like *L. lanarium*. Both sexes black. Female with frons reticulate, mesoscutum anterior margin with weakly bilobed mesial projection, anterolaterally finely plicate, mesially closely to densely punctate, dorsal surface of propodeum smooth, micro-alveolate, not defined by carinae. Male with antennae moderately long, AS4:AS2+3=1, lower paraocular areas with adpressed plumose hair forming a mat, metasomal tomentum almost absent, S2–S5 with long, plumose hair, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 8.55–9.09 mm ($\bar{x}$=8.80 mm, SD=0.20, n=6), head width 2.54–2.68 mm (n=6), forewing length 2.26–2.47 mm ($\bar{x}$=2.36 mm, SD=0.07, n=6). Relative dimensions: HW 100, HL 78–80, UID 55–57, LID 51–52, AOD 20–21, IAD 9–10, OAD 22–23, IOD 14–15, OOD 15–16, CL 20–21, GW 16–17, EW 24–25, SL 40–41, FL 68–69.

Structure. Head broad, inner orbits converging below, median frontal carina weakly developed, reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of lateral ocelli. Clypeus short (CL 0.4 × LID), distinctly convex basally, basal two-thirds with dull sheen, openly to closely punctate with large, deeply impressed, rounded punctures, anteriorly dull, with several small rounded punctures, supraclypeal area well projected, dull openly punctate with small, indistinct punctures. Frons (fig. 115A) reticulate above antennal bases, sculpture laterally weakens to almost smooth along inner orbits, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 115B) basal median area raised forming two large tubercles, surface weakly nodulated, lateral areas weakly recessed, anterior margin almost straight, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges almost absent, small ridges basally, setae not present across margin, distal setae originating in from margin, lateral teeth small, not distally hooked. Pronotum dorsolateral angles bluntly obtuse, well projected. Mesoscutum (fig. 115C) anterior margin with weakly bilobed mesial projection, punctation moderately coarse, anteriorly dull, anteromesially impunctate, anterolaterally finely plicate, plicae just reach level of anterior margin of parapsidal lines, mesially shining,

closely to densely punctate, laterad of parapsidal lines and in parapsidal areas densely punctate with punctures almost contiguous. Scutellum 1.4 × longer than dorsal surface of propodeum, surface with a dull sheen, densely punctate with variable sized punctures. Dorsal surface of propodeum (fig. 115C) not defined by carinae, posterovertical carinae extend less than half-way to dorsal level, dorsal sculpture smooth, microalveolate except a few weak striae along anterior margin, dorsal rim rounded. T1 densely punctate anteriorly, posterior marginal area openly to closely punctate. Mesepisternum and metepisternum striate. BP bluntly obtuse.

Colour. Body black except mandibles red-brown apically, flagellum dark brown underneath, posterior marginal area on T2–T4 and legs tinged with brown.

Vestiture. Body sparse, head with erect, minutely branched hair, clypeal hair simple, mesoscutum with small, erect, branched hair, metasomal tomentum laterally on T2, across T3 and T4 though not strong.

Description of male. Body length 7.16–8.24 mm ($\bar{x}$=7.86 mm, SD=0.51, n=4), head width 2.21–2.35 mm (n=4), forewing length 2.04–2.14 mm ($\bar{x}$=2.08 mm, SD=0.04, n=4). Relative dimensions: HW 100, HL 82–84, UID 61–62, LID 46–48, AOD 17–18, IAD 11–12, OAD 23–25, IOD 15–17, OOD 16–17, CL 20–21, GW 18–19, EW 29–30, ML 40–41, SL 30–31, FL 128–130.

Structure. Head broad, inner orbits emarginate, converging below, eyes with distinct cover of minute setae, clypeus convex, shining, roughened with large, shallow punctures, basal two-thirds pale white/yellow remainder brown, supraclypeal area well projected, median frontal carina forming strong keel on upper portion, surface dull except along midline shining, indistinctly closely punctate with small punctures. Antennae moderately long (FL 2.09 × UID), AS4:AS2+3=1. Remainder of body similar to female but frons with reticulations extending to lateral margins, mesoscutum anterolateral plicae weaker than in female, mesially shining and openly to closely punctate, dorsal surface of propodeum smooth except ruguloso-striolate on basal one third; colour similar to female except clypeus as noted, metasoma brown, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body with moderate hair cover, frons with short, erect simple hair, paraocular areas with long, plumose hair, lower paraocular areas with adpressed plumose hair forming a mat, some long hairs on lateral margins of clypeus, lower portion of scape with long plumose hair, mesepisternum with long, plumose hair, weak lateral tomentum on T2 only, almost absent; S2–S5 with long, posteriorly directed, plumose hair extending across sternites.

Genitalia and associated sterna (figs 115E–H). Gonobase sides weakly flanged basally, gonocoxite with setae on apical inner margins and dorsal and lateral setae, gonostyli setae long, branched and simple, retrorse lobes setose, well developed, ventral flanges absent; S8 median process apically narrowed and rounded, with setae, S7 median process truncate apically, setae present.

Distribution (fig. 115D). High rainfall, coastal areas of the southwest of Western Australia.

Floral Forage Record. Families visited=4. Catch total=4; Compositae (1 catch), Goodeniaceae (1), Stylidiaceae (1), Thymelaeacae (1); Genera visited=4; *Brachycome* (1), *Pimelea* (1), *Scaevola* (1), *Stylidium* (1).

Flight Phenology.

0	0	0	0	0	0	0	0	1	1	4	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum melanopterum and *L. mirandum*, two of the largest members of the subgenus (8.55–9.09 mm and 8.15–11.24 mm respectively), have distributions restricted to the high rainfall jarrah and karri forest areas in the southwestern corner of Western Australia.

Lasioglossum (Chilalictus) mesembryanthemi (Cockerell)

Figures 24A, 29D, 116A–H

Halictus mesembryanthemi Cockerell, 1926b: 246–247.

Lasioglossum (*Chilalictus*) *mesembryanthemi*. — Michener, 1965: 177.

Material examined. Holotype, ♀, Victoria, Port Philip, Rayment, USNM Type No. 55511 (USNM, missing all tarsal segments, except basitarsus, on mid and left hind legs, left flagellum broken but glued to head.)

Other specimens examined (49♀♀, 16♂♂). Victoria: Melbourne.

South Australia: Kingston SE: Kangaroo Island; Angas Plains; Mt Wedge; Orroroo.

Western Australia: Denmark; Gin Gin; Cowaramup Bay Nay Park; Yallingup; Narrogin; Carnac Is.; Dongarra.

Diagnosis. Most like *L. globosum*. Both sexes with body black. Female with frons striate, labrum distal process flanged distally, meso-

scutum sculpture fine, surface dull except small mesial area on posterior half shining, dorsal surface of propodeum ruguloso-striolate, S2 and S3 with long, erect, branched hair, branching on one side of hair only. Male with antennae moderately long, mesoventral area with two large posteriorly directed processes; S2 with long, plumose hair, S3 with weak lateral tufts present, S4 with conspicuous lateral tufts, tufts form concave shaped hair; male genitalia with penis valves angular apically; forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 5.78–7.93 mm ($\bar{x}$=6.91 mm, SD=0.50, n=10), head width 1.72–2.09 mm (n=10), forewing length 1.53–1.90 mm ($\bar{x}$=1.72 mm, SD=0.10, n=10). Relative dimensions: HW 100, HL 80–82, UID 62–63, LID 55–56, AOD 20–21, IAD 9–10, OAD 24–28, IOD 17–19, OOD 16, CL 20–21, GW 18–19, EW 24–26, SL 38–39, FL 67–69.

Structure. Head broad, inner orbits converging below, median frontal carina well developed, extends to median ocellus, eyes sparsely covered with minute setae. Scape reaches anterior margin of lateral ocelli. Clypeus short (CL 0.38 × LID), weakly convex, shining on basal two-thirds, closely punctate with shallow, elliptical punctures, remainder dull with minute transverse lineolation, supraclypeal area weakly projected, dull, with fine reticulate pattern, closely to densely punctate. Frons (fig. 116A) conspicuously striate above antennal bases, forming V-shaped lines along median frontal carina, sculpture laterally striolate to smooth along inner margins of eyes, extends vertically to posterior margin of lateral ocelli. Labrum (fig. 116B) basal median area raised, irregularly ridged, distal process not tapered, flanged distally, median keel spatulate, extends beyond setose distal margin, lateral ridges weak set at oblique angle to median keel, well short of distal margin, lateral teeth small weakly hooked. Pronotum dorsolateral angles obtuse, weakly projected. Mesoscutum (fig. 116C) anterior margin rounded, sculpture fine, anteriorly impunctate with transverse lineolation, mesially and along posterior margin densely punctured, laterally openly to closely punctate, parapsidal areas almost impunctate, surface dull except small mesial area on posterior half, shining. Scutellum 1.4 × longer than dorsal surface of propodeum, surface shining, openly to sparsely punctate. Dorsal surface of propodeum (fig. 116C) defined by posterior carinae set just below dorsal level, posterovertical carinae extend almost to dorsal carinae, dorsal sculpture mesially ruguloso-striolate, laterally striolate, sculpture almost reaching rim mesially, reaches laterally. T1 impunctate, covered with minute, transverse lineolation. Mesepisternum and metepisternum on upper half weakly striolate, some specimens almost smooth. BP bluntly obtuse; forewings with 1st m-cu interstitial with 1st r-m) or entering third submarginal cell.

Colour. Body black; mandibles red-brown, antennal flagellum above and legs dark brown, antennal flagellum underneath light red-brown, metasoma dark brown (WA and SA specimens) or light red-brown (Vic. specimens).

Vestiture. Body sparse, head and mesoscutum with erect, minutely branched hair, mesoventral hair minutely branched; S2 and S3 with long, erect, branched hair, branching on one side of hair only; weak lateral tomentum on T2–T4.

Description of male. Body length 5.78–6.93 mm ($\bar{x}$=6.23 mm, SD=0.31, n=10), head width 1.69–1.86 mm (n=10), forewing length 1.50–1.69 mm ($\bar{x}$=1.55 mm, SD=0.05, n=10). Relative dimensions: HW 100, HL 90–92, UID 65–67, LID 48–49, AOD 18–19, IAD 10–11, OAD 24–25, IOD 18–20, OOD 18, CL 22–23, GW 14–15, EW 28–30, ML 38–40, SL 30–31, FL 130–135.

Structure. Head elongate (HL 92), inner orbits converging below, eyes with sparse, minute setae, clypeus with pale yellow marking on at least basal half, sculpture similar to female except clypeus and supraclypeal area almost impunctate. Antennae moderately long (FL 2.02 × UID), flagellum segments broad, AS4:AS2+3=0.9. Remainder of body similar to female but with weaker mesoscutal punctation, openly to closely punctate mesially; dorsal surface of propodeum not defined by carinae; metasomal T1 sparsely punctate; mesoventral area with two large (half length of hind coxa) processes, processes well separated, bluntly pointed, posteriorly directed, parallel (fig. 24A); forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Similar to female except dense, white, adpressed, branched hair on at least lower half on face; weak tomentum present on metasomal T2 and T3; S2 with mesial area of long, plumose hair, S3 with long, plumose hair, mesial gap present forming weak lateral tufts present, S4 with conspicuous lateral tufts mesially glabrous, tufts with long plumose concave shaped hair, tufts extends beyond S5, S5 almost glabrous (fig. 29D).

Genitalia and associated sterna (figs 116E–H).

Gonobase sides narrowed basally, gonocoxite with setae on apical inner, ventral and lateral margins, dorsal surface striate, gonostyli narrow, with short, simple setae, penis valves angular apically, heavily sclerotised, retrorse lobes setose, well developed, ventral flanges absent; S8 median process elongate, truncate, with thickened setae apically, S7 median process rounded, glabrous.

Distribution (fig. 116D). Bassian province.

Floral Forage Record. Families visited=2. Catch total=6; Aizoaceae (3 catches), Compositae (3); Genera visited=5; *Arctotheca* (1), *Brachycome* (1), *Carpobrotus* (2), *Disphyma* (1), *Taraxacum* (1).

Flight Phenology.

0	1	1	1	1	0	0	3	5	13	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The published description of *L. mesembryanthemi* does not record the label data of the holotype. The specimen recognised here as the holotype, matches the description and has the word "type" in Cockerell's handwriting, on the determination label. Intraspecific variation occurs on metasomal colour with Victorian females having a light red-brown metasoma and females from South Australia and Western Australia a black metasoma tinged with dark brown. Males possess a pair of large mesoventral processes. This character is common to a species-group whose members forage on *Wahlenbergia*, although *L. mesembryanthemi* has no foraging records on *Wahlenbergia*. Parsimony analysis (Walker, 1994) did not place *L. mesembryanthemi* within the "*Wahlenbergia* species-group" and is the only species with male mesoventral processes not included. The flight phenology data suggest that *L. mesembryanthemi* is bivoltine with a spring and an autumn generation.

Lasioglossum (Chilalictus) mesostenoideum sp. nov.

Figures 26C, 26D, 117A–H

Material examined. Holotype, ♀, Western Australia, 40 km N of Norseman (31°52′S, 121°47′E), 20 Nov 1989, KLW, on *Eremophila* (NMV T-15635).

Paratypes. 16♀♀, 33♂♂, same data as holotype (NMV; ♀♀ T-15636–15651, ♂♂ T-15652–15684).

Other specimens examined (51♀♀, 53♂♂). South Australia: Whyalla, Penong.

Western Australia: Norseman, Balladonia, Norseman, Yellowdine, Coolgardie.

Diagnosis. Like *L. quadratum* and *L. smaragdinum*. Female with head green, mesoscutum metallic coppery green, metasoma copper, frons elongated, striate, mesoscutum narrowed, length 0.91 × width, surface dull, closely to densely punctate, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae set well below dorsal level, fore tibial spur fan shaped. Male with body copper, antennae moderately long (FL 1.66 × UID), AS4:AS2+3=0.6, S2 and S3 with long, plumose hair, S4 with similar hair except with mesial hair gap, in gap, small, rounded median process, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 3.31–3.77 mm ($\bar{x}$=3.50 mm, SD=0.10, n=10), head width 0.94–1.01 mm (n=10), forewing length 0.85–0.96 mm ($\bar{x}$=0.90 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 94–95, UID 64–65, LID 59–60, AOD 19–20, IAD 12–13, OAD 42–43, IOD 27–28, OOD 16–17, CL 20–21, GW 19–20, EW 30–31, SL 39–40, FL 70–72.

Structure. Head elongate, almost as long as broad, appears square shaped, inner orbits parallel, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape well short of reaching median ocellus. Clypeus short (CL 0.35 × LID), surface flat except weakly concave mesially, convex laterally, surface shining except dull along anterior margin, mesially roughened with several broad shallow grooves, laterally with a few broad, shallow rounded punctures, anterior margin with a few minute punctures, supraclypeal area slightly raised, surface dull, impunctate. Frons (fig. 117A) elongated, finely striate above antennal bases, sculpture laterally weakens to punctate, extends vertically beyond lateral ocellus onto lateral margins of vertex. Labrum (fig. 117B) median basal area raised forming V-shaped tubercles, anterior margin rounded mesially, margin raised forming curved lip, distal process triangular, widest at base, median keel broad, extends to distal margin, lateral ridges large, dorsally smooth, basally recurved towards median keel, setae not present across distal margin, lateral teeth absent. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 117C) narrowed, length 0.91 × width, anterior margin rounded, punctation moderately coarse, surface with a dull metallic sheen, anteriorly impunctate, remainder closely to densely punctate with small, rounded, shallow punctures. Scutellum length equal to dorsal surface of propodeum, surface smooth and highly polished except punctate and dull along midline and

around margins. Dorsal surface of propodeum (fig. 117C) defined by posterolateral carinae set well below dorsal level, carinae angular forming distinct lip, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate, almost reaches dorsal rim mesially, rim smooth with a dull sheen. T1 densely punctate except posterior marginal area impunctate. Mesepisternum upper half and metepisternum dull and finely striate, lower half of mesepisternum smooth and shining. Fore tibial spur fan shaped; BP broadly rounded.

Colour. Head dark green, mesoscutum metallic coppery green, metasoma copper, mandibles amber except red-brown apically, antennal flagellum light brown underneath, mesoscutum tinged with blue, around margin distinct blue/violet line, scutellum coppery blue, legs with apical one third of femora, tibiae and tarsi light red-brown, remainder dark brown.

Vestiture. Body sparse, frons almost glabrous, paraocular areas with a few, erect, minutely branched hairs, mesoscutum glabrous except a few short hairs around margins, metasomal tomentum absent.

Description of male. Body length 3.08–3.39 mm ($\bar{x}$=3.24 mm, SD=0.14, n=10), head width 0.96–1.01 mm (n=10), forewing length 0.75–0.82 mm ($\bar{x}$=0.80 mm, SD=0.03, n=10). Relative dimensions: HW 100, HL 89–90, UID 64–65, LID 52–53, AOD 14–15, IAD 13–14, OAD 34–35, IOD 27–28, OOD 16–17, CL 19–20, GW 19–20, EW 35–36, ML 44–46, SL 33–34, FL 106–108.

Structure. Head elongate, appears square, inner orbits converging below, eyes with sparse cover of minute setae, scape not reaching median ocellus, clypeus weakly convex, surface highly polished, ventromesially weakly concave, basal half impunctate and yellow, anteriorly with a few minute punctures, dark brown, supraclypeal area weakly raised, smooth, impunctate, with a dull sheen. Antennae moderately long (FL 1.66 × UID), AS4:AS2+3=0.6. Remainder similar to female, frons striate, median frontal carina reaches median ocellus, pronotum dorsolateral angles rounded, not projected, mesoscutum shining on posterior two third, anteriorly with a dull sheen, closely to densely punctate with small rounded punctures, scutellum highly polished and impunctate, dorsal surface of propodeum defined by weak posterolateral carinae set well dorsal level, sculpture finely ruguloso-striolate; colour of body coppery, legs with tibiae and tarsi light red-brown, remainder brown; S4 with small, rounded median process (figs 26C–D), forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Frons and lower paraocular areas with short, adpressed hair, in paraocular areas forming a mat, remainder of body cover sparse, metasomal tomentum absent; S2 and S3 with dense cover of posteriorly directed, plumose hair, S4 with similar hair except with mesial almost glabrous except small, rounded median process with cover of short hair (figs 26C, 26D), S5 and S6 with short, simple adpressed hair.

Genitalia and associated sterna (figs 117E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli long, with long, branched hair apically, retrorse lobes well developed, almost glabrous, with a few setae on basal inner margins, ventral flanges present; S8 median process elongate, apically rounded and setose, S7 median process rounded and glabrous.

Distribution (fig. 117D). Southern Eyrean province following the floral distribution of "mallee".

Etymology. The epithet *mesostenoideum* means "narrowed in the middle" and refers to the narrow, elongate mesoscutum.

Floral Forage Record. Families visited=2. Catch total=6; Myoporaceae (3 catches), Myrtaceae (3); Genera visited=3; *Eremophila* (3), *Eucalyptus* (2), *Melaleuca* (1).

Flight Phenology.

2	0	0	0	0	0	0	0	2	3	4	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum mesostenoideum belongs to a species-group (includes *L. quadratum* and *L. smaragdinum*) in which both sexes are characterised by a square head and narrow, elongated mesoscutum. The head appearance is due to an elongated frons combined with minimal convergence of the eyes. The degree of frons elongation in this species-group (over 40% of head width), is the highest recorded. The narrow mesoscutum is the result of elevation and elongation of the mesoscutum combined with reduction in its width. A large series of both sexes was collected at Whyalla, South Australia, which is the most easterly record for this species. No female intraspecific variation was noted. Males collected at Whyalla have the anterior half of the clypeus dull white (yellow on males from Western Australia) and the vestiture on the clypeus with a conspicuous cover of plumose hair (sparse on Western Australian specimens).

Other external morphological characters are similar and examination of genitalia confirms conspecificity between the populations.

Lasioglossum (Chilalictus) metallicum sp. nov.

Figures 118A–H

Material examined. Holotype. ♀, Western Australia, 47 km S of Norseman (32°35′S, 121°47′E), 31 Oct 1989, KLW, on *Lechenaultia* (Blue) (NMV T-15685).

Paratypes (7♀♀, 1♂). Western Australia 1♀, 11 km SW of Mt Singleton (29°29′S, 117°11′E), 28 Sep 1981, IDN & JCC, om *Melaleuca* (ANIC); 1♀, Boorabbin Rock (31°12′S, 120°17′E), 4–9 Oct 1981, TFH, 408-6, on *Pultenaea* affin. *neurocalyx* (WAM 87/175); 1♀, Boorabbin Rock (31°12′S, 120°17′E), 4–9 Oct 1981, TFH, 408-6, on *Jacksonia* (WAM 87/176); 1♀, 33 km E of Yellowdine (31°16′S, 120°00′E), 10 Oct 1981, IDN & JCC (ANIC); 2♀♀, Guildford (31°54′S, 115°58′E), 1915-411 (ANIC); 1♀, 35 km E of Norseman (32°12′S, 122°04′E), 30 Oct 1989, KLW, on *Eremophila* (NMV T-15686); 1♂, same data as holotype (NMV T-15687).

Diagnosis. Most like *L. eremaean*. Female with body black except clypeus, supraclypeal area, mesoscutum and scutellum metallic blue tinged with green, frons striate, mesoscutum densely punctate, dorsal surface of propodeum rugulosostriolate on basal half, not defined by carinae, T1 with small mesolateral hair tufts. Male with body black, mesoscutum with bluish tinge, antennae moderately short (FL 1.65 × UID), AS4:AS2+3=0.7, S3–S5 with large lateral hair tufts, mesial area of S3–S5 glabrous, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.08–8.62 mm ($\bar{x}$=7.91 mm, SD=0.53, n=8), head width 2.49–2.63 mm (n=8), forewing length 2.07–2.28 mm ($\bar{x}$=2.15 mm, SD=0.07, n=8). Relative dimensions: HW 100, HL 78–80, UID 59–60, LID 54–55, AOD 20–21, IAD 10–12, OAD 24–25, IOD 18–19, OOD 15–16, CL 20–21, GW 14–15, EW 21–22, SL 39–40, FL 58–60.

Structure. Head broad though distinctly triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with moderate cover of minute setae. Scape reaches anterior margin of lateral ocelli. Clypeus and supraclypeal area prominent, slightly raised and glabrous, clypeus short (CL 0.38 × LID), flat to weakly convex, polished, basally openly to closely punctate with deeply impressed small and large punctures, anteriorly densely punctate with small, rounded punctures, supraclypeal polished, openly punctate with small punctures. Frons (fig. 118A) striate above antennal bases, interconnective striae present giving partial reticulate pattern, sculpture laterally weakens to smooth along inner orbits, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 118B) median basal area raised, surface smooth except a few weak nodules present, anterior margin obtuse mesially, distal process widest at base, lateral margins almost parallel, median keel spatulate, extends to setose distal margin, lateral ridges absent, lateral teeth absent. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 118C) anterior margin weakly bilobed, punctation conspicuously coarse, anteriorly impunctate, remainder densely punctate, punctures small, interspaces present. Scutellum 1.5 × longer than dorsal surface of propodeum, surface shining, closely to densely punctate. Dorsal surface of propodeum (fig. 118C) not defined by carinae, posterovertical carinae extend less than half-way to dorsal level, dorsal sculpture weakly ruguloso-striolate mesially, a few striae laterally, sculpture on basal half only, dorsal rim with distinctly rounded angle from dorsal to vertical surface. Metasomal T1 densely punctate. Mesepisternum and upper portion of metepisternum striate, remainder smooth. BP broad, bluntly obtuse apically.

Colour. Frons black, clypeus and supraclypeal area weakly metallic except along anterior margin of clypeus metallic blue, mesoscutum and scutellum metallic blue tinged with green, metanotum and propodeum black, metasoma black, posterior marginal areas light brown, legs dark brown.

Vestiture. Body sparse, frons and paraocular areas with long, erect, plumose hair, mesoscutum with short, erect, branched hair except weak band of short, erect plumose hair around margins, T1 with small mesolateral hair tufts, tomentum across T2–T4.

Description of male. Body length 6.55mm, head width 1.97mm, forewing length 1.62mm. Relative dimensions: HW 100, HL 83, UID 62, LID 48, AOD 16, IAD 11, OAD 26, IOD 20, OOD 16, CL 20, GW 14, EW 26, ML 36, SL 33, FL 102.

Structure. Head triangular, inner orbits converging below, eyes with sparse cover of minute setae, scape just reaches anterior margin of median ocellus, clypeus weakly convex, shining, indistinctly weakly roughened, supraclypeal area projected, shining, openly punctate, clypeus with pale yellow marking on basal half, remainder yellow. Antennae moderately short

(FL 1.65 × UID), AS4:AS2+3=0.7. Remainder of body similar to female but with mesoscutum densely punctate, a few mesial punctures closely punctate, scutellum openly punctate, dorsal surface of propodeum sculpture weak mesially; colour similar to female except clypeus and supraclypeal area without metallic colouration. mesoscutum black tinged with blue, metasoma dark brown, legs brown with fore, mid and hind tibiae and tarsi light red-brown, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, frons with short, simple adpressed and semi-erect, branched hair, paraocular areas with short, adpressed, plumose hair forming a mat, genae with long hair almost forming a beard, T1 with weak mesolateral hair patch not forming tufts, tomentum laterally on T2–T4, S2 with a few erect, minutely branched hair, S3–S5 with large lateral hair tufts of long, minutely branched hair, mesial area of S3–S5 glabrous, S6 with a few minute, simple setae.

Genitalia and associated sterna (figs 118E–H). Gonobase sides slightly narrowed basally, gonocoxite setose on inner apical margin, gonostyli short, swollen apically, weakly setose with short simple and branched hairs, retrorse lobes setose, well developed, ventral flanges absent, penis valves slightly flanged basally; S8 median process elongate, apically rounded with a few setae, S7 median process apically rounded, glabrous.

Distribution (fig. 118D). Southwest of Western Australia along the boundary of the Bassian and Eyrean provinces.

Etymology. The epithet *metallicum* refers to the metallic colour on the mesoscutum and scutellum.

Floral Forage Record. Families visited=4. Catch total=5; Fabaceae (2 catches), Goodeniaceae (1), Myoporaceae (1), Myrtaceae (1); Genera visited=5: *Eremophila* (1), *Jacksonia* (1), *Lechenaultia* (1), *Melaleuca* (1), *Pultenaea* (1).

Flight Phenology.

0	0	0	0	0	0	0	0	1	5	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Most of the metallic taxa form a monophyletic clade (Walker, 1994) based on a range of synapomorphies (female frons length, labrum shape, colour and male genital characters). *Lasioglossum metallicum* and *L. eremaean*, two metallic species display (with the exception of the mesosomal colour) a quite different range of characters and are placed in another monophyletic clade (Walker, 1994). This suggests that the metallic colour of these species is independently derived.

Lasioglossum (Chilalictus) mirandum (Cockerell)

Figures 12B, 16F, 119A–H

Halictus mirandus Cockerell, 1914b: 8.
Lasioglossum (Chilalictus) mirandum. — Michener 1965: 177.

Material examined. Syntype. ♀, Western Australia, Yallingup, near Cape Naturaliste (33°39'S, 115°01'E). 14 Sep–31 Oct 1913. R.E. Turner, BM Type Hym 17.a.971 (BMNH; 1♀ with similar label data lodged in USNM, R. McGinley (personal communication)).

Other specimens examined (241♀♀, 36♂♂). Victoria: Gorae West (see *Distribution* for comment).

Western Australia: King George Sound, Denmark, Bow Bridge, Walpole, Porongorup Range, Stirling Range, Perup, Augusta, Cranbrook, Pemberton, Balbarrup, Calgardup, Nannup, Broomehill, Kojonup, Margaret River, Red Hill, Katanning, Busselton, Donnybrook, Meelup Beach, Capel, Collie, Bunbury, Dumbleyung, Dwellingup, Waroona, Narrogin, Dryandra, Darling Range, Bedfordale, Gosnells, Perth, Kalamunda, Greenmount, Guildford, Pearce.

Diagnosis. Unlike any other species. Both sexes black. Female with frons weakly recessed, finely striate, mesoscutum anterior margin weakly bilobed, punctation fine, impunctate except mesially openly doubly punctate, dorsal surface of propodeum micro-alveolate and striolate, defined by posterior and lateral carinae set at dorsal level, T1 with raised longitudinal keel. Male with antennae long, AS4:AS2+3=1.2, S2–S4 with weak branched hair, S5–S6 almost bare except S6 with small hair tuft posteriorly, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 8.55–11.24 mm ($\bar{x}$=10.41 mm, SD=0.72, n=10), head width 2.61–3.12 mm (n=10), forewing length 2.35–3.01 mm ($\bar{x}$=2.83 mm, SD=0.19, n=10). Relative dimensions: HW 100, HL 77–78, UID 56–57, LID 58–59, AOD 20–21, IAD 9–11, OAD 21–22, IOD 16–17, OOD 14–15, CL 22–24, GW 16–18, EW 23–24, SL 42–43, FL 74–76.

Structure. Head broad, inner orbits slightly converging above, median frontal carina well developed reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches well beyond lateral ocelli. Clypeus short (CL 0.41 × LID), weakly convex, more so ventrally, basally with a dull sheen, ventromesially coarsely roughened with irregularly shaped, deeply impressed punctures, ventrolaterally smooth and shining with a few punctures, anteriorly

surface dull, openly to closely punctate, supraclypeal area well projected, shining mesially, remainder dull, openly punctured with small, rounded punctures. Frons (fig. 119A) weakly reeessed and finely striate above antennal bases, seulpture laterally almost smooth, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 119B) median basal area raised, variously nodulated forming irregularly shaped ridges, anterior margin rounded mesially, lateral areas weakly recessed, distal proeess not tapered, widest at base, median keel extends well beyond distal margin, lateral ridges large, serrate, extend to margin, distal margin deeply reeessed, without setae across margin, distal setae longer than penultimate setae, lateral teeth large, serrate on posterior margin, distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoseutum (fig. 119C) anterior margin with weakly bilobed mesial projeetion, punetation moderately fine, anteriorly and in parapsidal areas dull with fine lineolation and impunetate, mesially shining, distinetly doubly punetate, with large and small punetures openly punetate. Seutellum 1.13 × longer than dorsal surface of propodeum, sparsely punctate, weakly eoneave along midline. Dorsal surfaee of propodeum (fig. 12B) defined by posterior and lateral carinae set at dorsal level, posterior earinae well developed forming raised eurved lip, posterovertieal earinae reaching dorsal carinae, dorsal seulpture weak, surface dull, miero-alveolate, mesially striolate, laterally striate, seulpture not reaching rim. T1 densely punetate except posterior marginal area impunctate, anteriorly with raised longitudinal keel (fig. 16F), T2 and T3 slightly raised along midline. Mesepisternum with horizontal striae, metepisternum with horizontal striae on upper portion, remainder smooth. BP rounded.

Colour. Body black except, mandibles redbrown apically, in some speeimens frons above antennal base, mesoseutum and seutellum with dark blue tinge, metasoma dark brown in some specimens, legs light red-brown exeept coxae, trochanters and basal half of fore femora dark brown.

Vestiture. Body sparse, faee dark brown, erect, minutely branched hair, mesoseutum with similar shorter hair, metanotum with a small tufts of hair mesially, eonspicuous white tomentum laterally on T2–T4.

Description of male. Body length 7.07–9.09 mm ($\bar{x}$=8.46 mm, SD=0.55, n=10), head width 2.31–2.62 mm (n=10), forewing length 2.11–2.44 mm ($\bar{x}$=2.28 mm, SD=0.10, n=10). Relative dimensions: HW 100, HL 80–83, UID 58–60, LID 48–49, AOD 16–17, IAD 11–12, OAD 20–22, IOD 18–19, OOD 14–15, CL 24–25, GW 15–17, EW 26–29, ML 35–38, SL 25–27, FL 151–153.

Structure. Head broad, inner orbits converging below, eyes with sparse, minute setae, frons above antennal bases and ocelloeeiputal area weakly eoneave, elypeus almost flat mesially, weakly convex laterally, densely punetate with large, shallow punctures, giving irregular roughened seulpture, pale yellow markings on at least basal half, supraelypeal area projected, dull, impunctate. Antennae long (FL 2.55 × UID), AS4:AS2+3=1.2. Remainder of body similar to female but with mesoseutum dull, single punetation size, openly punetate mesially, remainder impunctate, T1 longitudinal keel present though weaker than in female, BP weak, dorsal surfaee defined by weakly defined; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, similar to female exeept paraocular areas and upper portion of supraclypeal areas with short, semi-adpressed, plumose hair forming a mat, metanotum without mesial hair tuft, metasomal tomentum absent, sternal vestiture weak, S2–S4 with semiadpressed, posteriorly direeted hair, S5 and S6 almost bare exeept S6 with small hair tuft posteriorly.

Genitalia and associated sterna (figs 119E–H). Gonobase sides flanged basally, gonoeoxite setose on apieal inner margins, gonostyli setae long, branehed, retrorse lobes setose, well developed, ventral flanges absent; S8 median proeess rounded apieally, with setae simple, S7 median process rounded, with a few setae.

Distribution. (fig. 119D). High rainfall areas of southwestern Western Australia. I suggest that the single specimen from Gorae West, Vietoria (T. Rayment, ANIC) has been ineorrectly labelled as it is the only distribution reeord outside of southwestern Western Australia.

Floral Forage Record. Families visited=2. Catch total=17; Myrtaeeae (14 eatehes), Proteaeeae (3); Genera visited=4; *Eucalyptus* (13), *Grevillea* (1), *Hakea* (2), *Melaleuca* (1).

Flight Phenology.

7	5	1	3	4	0	0	0	2	7	6	12
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. (See *Remarks* for *L. melanopterum.*) The species has two unique charaeters, females with serrate margins on the labrum lateral teeth

and males and females with a median keel on T1. Several macrocephalic males (ALM) were examined and differ from normal males (NLM) as follows: (ratios expressed as NLM (ALM)) eyes divergent below, gena width (GW:EW) 0.59 (1.14), mandibular length (ML:HW) 0.39 (0.49) and flagellum length (FL:UID) 2.55 (1.9).

Lasioglossum (Chilalictus) moreense (Cockerell)

Figures 21F, 120A–H

Halictus moreensis Cockerell, 1930: 40.
Lasioglossum (Chilalictus) moreense. — Michener, 1965: 177.

Material examined. Holotype. ♀, New South Wales, Moree (29°28′S, 149°51′E), March 1923, A.P. Dodd, QM Type No. T-4101 (QM).

Other specimens examined (39♀♀, 9♂♂.) Queensland: Leyburn, Roma.

New South Wales: Gilgandra, Coonamble, Moree.

Diagnosis. Like *L. lamellosum*. Both sexes with body black. Female with frons striate, mesoscutum with dense punctation moderately, dorsal surface of propodeum ruguloso-striolate, defined by posterior and lateral carinae set just below dorsal surface, clypeus and lower paraocular area light brown, legs light red-brown, posterior marginal areas of T1–T4 light red-brown, body conspicuously hirsute, mesoscutum hair forms circular pattern, all lateral hair directed mesially, conspicuous tomentum across T2–T5. Male with antennae moderately long, mid coxae with large, thin, elliptical, processes, at least half length of trochanters, processes almost clear, hind coxae densely covered with long, plumose hair; S5 and S6 with strong, mesial hair tufts inwardly directed with small mesial gap; forewings with 2nd r-m as strong as 1st r-m, 1st m-cu enters third submarginal cell.

Description of female. Body length 8.55–10.01 mm ($\bar{x}$=9.15 mm, SD=0.54, n=10), head width 2.34–2.56 mm (n=10) forewing length 2.26–2.47 mm ($\bar{x}$=2.38 mm, SD=0.10, n=10). Relative dimensions: HW 100, HL 77–78, UID 62–63, LID 56–58, AOD 21–22, IAD 10–12, OAD 23–24, IOD 16–17, OOD 16–17, CL 21–22, GW 20–22, EW 23–25, SL 41–45, FL 71–73.

Structure. Head distinctly broad, inner orbits converging slightly below, median frontal carina extends to median ocellus, eyes sparsely covered with minute setae. Scape reaches posterior margin of lateral ocelli. Clypeus short (CL 0.41 × LID), convex, shining, densely punctate along basal margin, remainder closely to densely punctured with large, rounded punctures, supraclypeal area almost confluent with clypeus, surface dull, covered with fine reticulate pattern, closely punctured. Frons (fig. 120) striate above antennal bases, sculpture laterally ruguloso-striolate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 120B) basal median area raised, surface weakly verruculose, anterior margin rounded, laterally slightly raised, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges weak, serrate, extend to distal margin, setae not present across distal margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles bluntly obtuse, weakly projected. Mesoscutum (fig. 120C) anterior margin rounded, punctation moderately coarse, mesial interspaces shining, remainder dull, mesially and parapsidal areas dense punctation, mesial puncture with interspaces, parapsidal punctures contiguous. Scutellum 1.06 × longer than dorsal surface of propodeum, shining, closely to densely punctured. Dorsal surface of propodeum (fig. 120C) defined by posterior and lateral carinae set just below dorsal surface, posterovertical carinae reaching at least halfway to dorsal carinae, dorsal sculpture mesially ruguloso-striolate, laterally striolate, sculpture reaches dorsal rim. T1 densely punctured. Mesepisternum and metepisternum striate. BP rounded.

Colour. Head and mesoscutum black except basal half of clypeus and lower paraocular area light brown, mandibles dark red-brown apically, scape and flagellum light red-brown, propodeum dark brown, legs light red-brown, metasomal tergites dark brown to black, posterior marginal areas of T1–T4 light red-brown, colour conspicuous due to dense white tomentum.

Vestiture. Body conspicuously hirsute, paraocular areas with dense adpressed, minutely branched hair, frons with erect, simple hair, mesoscutum with dense cover of short semi-adpressed hair, hair forming circular pattern, all lateral hair directed mesially, conspicuous tomentum across T2–T5.

Description of male. Body length 7.31–8.08 mm ($\bar{x}$=7.66 mm, SD=0.31, n=8), head width 2.14–2.21 mm (n=8), forewing length 1.93–2.07 mm ($\bar{x}$=1.98 mm, SD=0.05, n=8). Relative dimensions: HW 100, HL 81–83, UID 61–62, LID 51–52, AOD 19–20, IAD 14–15, OAD 22–23, IOD 16–17, OOD 16–17, CL 23–24, GW 18–20, EW 25–26, ML 38–39, SL 33–34, FL 115–118.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of minute setae, clypeus with pale yellow marking on at least basal three-quarters, mesial colour bar to posterior margin, supraclypeal area confluent with clypeal angle, antennae, tibiae, tarsi and anterior one third of femora light red-brown; sculpture similar to female. Antennae moderately long (FL 1.91 × UID), AS4:AS2+3=1. Remainder of body similar to female but with pronotal lateral processes not projected, anterior margin of mesoscutum produced, mesoscutum shining, densely punctured, dorsal surface of propodeum defined by posterior carinae only, sculpture reticulate; mid coxae with large, thin, elliptical, processes, at least half length of trochanters, processes almost clear, hind coxae densely covered with long, plumose hair (fig. 21F); forewings with 2nd r-m as strong as 1st r-m, 1st m-cu enters third submarginal cell.

Vestiture. Similar to female but with paraocular areas and frons densely covered with adpressed, branched hair, genal hairs long, inner margins of fore coxae with long hair tufts; S2 with weak erect mesial hair tuft, S3 and S4 with weak rows of simple hair across sterna, S5 and S6 with strong, mesial hair tufts inwardly directed with small mesial gap (cf. fig. 29B).

Genitalia and associated sterna (figs 120E–H). Gonobase narrowed basally, gonocoxite with lateral setae, gonostyli apically enlarged with long, branched setae, retrorse lobes finely setose, well developed, ventral flanges absent, penis valves flanged dorsally; S8 median process elongate, truncate, glabrous, S7 median process rounded, glabrous.

Distribution. (fig. 120D). Bassian although restricted to southeastern Queensland (Darling Downs) and New England Tableland.

Floral Forage Record. Families visited=2. Catch total=4;Anacardiaceae (1 catch), Myrtaceae (3); Genera visited=2; *Eucalyptus* (3), *Schinus* (1).

Flight Phenology.

1	1	1	0	1	0	0	0	0	0	3	3	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Remarks. See *Remarks* on *L. lamellosum*.

Lasioglossum (Chilalictus) mu sp. nov.

Figures 12C, 122A–H

Material examined. Holotype. ♀, Victoria, N of Lakes Entrance, Colquhoun State Forest (37°47′S, 147°57′E), 20–22 Feb 1985, KLW, on *Eucalyptus* (NMV T-15688).

Paratypes (81♀♀, 10♂♂). Queensland: 4♀♀, 4♂♂, Toowoomba (27°34′S, 151°57′E), 27 Dec 1965, JCC, on *Eucalyptus* (UQIC); 1♀, Tambourine (27°58′S, 153°11′E), 25 Apr 1962, E.B. Teh (UQIC); 3♀♀, Stanthorpe (28°40′S, 151°56′E), 20 Dec 1929 (UQIC).

New South Wales and Australian Capital Territory: 1♀, New England Nat. Pk, near Entrance (30°53′S, 153°01′E), 21 Nov 1960, C.W. Frazier (ANIC); 1♀), 17 km W of Coonabarabran (31°16′S, 148°25′E, 6 Dec 1976, EME & T. Low, on *Eucalyptus* (UQIC).

Victoria: 1♀, Kallista (37°53′S, 142°22′E), 13 Mar 1949, A.B (NMV T-15689); 56♀♀, 4♂♂, N of Lakes Entrance, Colquhoun State Forest (37°47′S, 147°57′E), 20–22 Feb 1985, KLW, on *Eucalyptus* (NMV ♀♀, T-15690–15747); 9♀♀, same locality, 2–6 Feb 1987, KLW & C. McPhee, on *Eucalyptus* (NMV T-15753–15761); 2♀, 11 km W of Nowa Nowa, Colquhoun State Forest (37°47′S, 147°57′E), 5 Mar 1984, KLW, on *Eucalyptus* (NMV T-15762–15763); 1♀, Lakes Entrance (37°53′S, 148°00′E), Oct 1919, F.E. Wilson (NMV T-15764).

Diagnosis. Like *L. tamburinei*. Both sexes with body black. Female with frons above antennal bases recessed, coarsely reticulate, labrum distal margin deeply notched on either side of medial keel, mesoscutum anterior margin with weakly bilobed mesial projection, punctation moderately coarse, mesial area shining (in shape of letter M), dorsal surface of propodeum alveolate with weak ruguloso-striolate pattern; tomentum across tergites. Male with antennae conspicuously long, AS4:AS2+3=1.4, legs with femora, tibiae and tarsi light red-brown, paraocular areas hair forming a mat, S2 and S3 with rows of erect branched hair, S4 with rows of adpressed branched hair, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.85–9.32 mm ($\bar{x}$=8.73 mm, SD=0.51, n=10), head width 2.37–2.49 mm (n=10), forewing length 2.30–2.56 mm ($\bar{x}$=2.46 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 81–82, UID 56–58, LID 57–58, AOD 21–22, IAD 9–11, OAD 22–24, IOD 15–17, OOD 15–16, CL 21–22, GW 14–16, EW 24–25, SL 44–45, FL 77–78.

Structure. Head broad, inner orbits parallel to slightly diverging below, median frontal carina well developed, reaches median ocellus, eyes with sparse cover of minute setae. Scape reaching well beyond lateral ocelli. Clypeus short (CL 0.37 × LID), weakly convex, surface shining except dull along anterior margin, surface coarsely roughened, basally with irregularly shaped punctures, mesially with rounded punc-

tures all densely punctate, anterior margin indistinctly punctate, supraclypeal area projected, shining mesially, dull around margins, sparsely punctate. Frons (fig. 121A) recessed and coarsely reticulate above antennal bases, laterally raised to paraocular level and almost smooth, sculpture extends to at least anterior margin of lateral ocelli. Labrum (fig. 121B) basal median area slightly raised, smooth to weakly nodulated, anterior margin obtuse mesially, distal process not tapered, widest at base, median keel extends well beyond distal margin, distal margin deeply notched on either side of medial keel, setae not across margin, distal setae distinctly longer than penultimate setae, lateral ridges large, serrate, extend to distal margin, lateral teeth large, distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 121C) anterior margin with weakly bilobed mesial projection, punctation moderately coarse, anterior median line deeply furrowed, anteriorly dull with fine transverse lines, mesial area shining (in shape of letter M), area closely punctate, parapsidal areas dull, covered with a close reticulate pattern. Scutellum 1.3 × longer than dorsal surface of propodeum, shining and openly to sparsely punctate but dull and densely punctate along posterior margin. Dorsal surface of propodeum (fig. 12C) defined by posterior carinae set at dorsal level, carinae raised to form sharply edged lip, posteroventical carinae reach dorsal carinae, dorsal sculpture finely alveolate with weak ruguloso-striolate pattern mesially, striolate laterally, sculpture not reaching rim. T1 densely punctate. Mesepisternum and metepisternum finely striate on anterior half, remainder smooth. BP rounded.

Colour. Head and mesosoma black except mandibles red-brown apically, antennae light brown underneath, metasoma and legs dark brown.

Vestiture. Body sparse, face and mesoscutum with erect, weakly branched hair, shorter on mesoscutum, hind coxae and trochanter with dense plumose hair, T2–T5 with dull white tomentum across tergites.

Description of male. Body length 6.39–7.16 mm ($\bar{x}$=6.84 mm, SD=0.32, n=6), head width 1.83–2.23 mm (n=6), forewing length 1.83–2.07 mm ($\bar{x}$=1.92 mm, SD=0.09, n=6). Relative dimensions: HW 100, HL 83–85, UID 56–59, LID 47–48, AOD 17–19, IAD 15–16, OAD 24–25, IOD 17–19, OOD 15–17, CL 20–21, GW 15–16, EW 28–29, ML 36–38, SL 28–30, FL 199–205.

Structure. Head broad, inner orbits converging below, eyes with distinct cover of setae, scape just reaches anterior margin of median ocellus, clypeus convex, shining, indistinctly openly punctate, basal three-quarters dull white, supraclypeal area shining, weakly projected. Antennae conspicuously long (FL 3.47 × UID), AS4:AS2+3=1.4. Remainder of body similar to female except mesoscutum mesial area shining, parapsidal area weakly reticulate, scutellum sparsely punctate, dorsal surface of propodeum posterior carinae weakly ridged, dorsal sculpture coarsely ruguloso-striolate, legs with femora, tibiae and tarsi light red-brown, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Paraocular areas with dense short semi-adpressed plumose hair forming a mat, frons with short and long simple hair, genae with long branched hair, clypeus and supraclypeal area almost glabrous, metasomal tomentum absent; S2 and S3 with rows of erect branched hair, S4 with rows of adpressed branched hair, S5 with rows of adpressed, simple and weakly branched hair.

Genitalia and associated sterna (figs 121E–H). Gonobase sides flanged basally, gonocoxite without setae, gonostyli short and broad, short simple setae on upper surface, apically with several thickened elongate setae, retrorse lobes setose, well developed, ventral flanges present; S7–S8 median processes elongate, apically rounded, each with several setae.

Distribution (fig. 121D). Eastern zone of the Bassian province.

Etymology. The epithet *mu* refers to the shining "M" on the female mesoscutum.

Floral Forage Record. Family visited. Catch total=7, Myrtaceae (7 catches). Genus Visited, *Eucalyptus* (7).

Flight Phenology.

0	4	2	1	0	0	0	0	0	1	1	3
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. A clinal size variation in both sexes is apparent with southern specimens larger than northern specimens.

Lasioglossum (Chilalictus) mundulum (Cockerell)

Figures 122A–H

Halictus mundulus Cockerell, 1916b: 366.
Halictus dorsicyaneus Cockerell, 1930: 46, syn. nov.
Halictus luctificus Cockerell, 1930: 46–47, syn. nov.

Halictus nigropurpureus Rayment 1935: 701. syn. nov.

Halictus anexoneuroides Rayment 1953: 11. syn. nov.

Lasioglossum (*Chilalictus*) *mundulum*. — Michener, 1965: 177.

Lasioglossum (*Chilalictus*) *dorsicyaneum*. — Michener, 1965: 176.

Lasioglossum (*Chilalictus*) *luctificum*. — Michener, 1965: 176.

Lasioglossum (*Chilalictus*) *nigropurpureum*. — Michener, 1965: 177.

Lasioglossum (*Chilalictus*) *anexoneuroides*. — Michener, 1965: 175.

Material examined. Holotype of *mundulus*, ♀, Western Australia, Kalamunda (31°58′S, 116°03′E), 14 March–14 April 1914, R.E. Turner, BM Type Hym 17.a.939 (BMNH).

Holotype of *dorsicyaneus*, ♀, Tasmania, Launceston (41°26′S, 147°08′E), 23 Jan 1916, F.M. Littler, USNM Type No. 57827 (USNM).

Holotype of *luctificus*, ♀, Tasmania, Launceston (41°26′S, 147°08′E), 23 Jan 1916, F.M. Littler (ANIC).

Holotype of *nigropurpureus*, ♀, Victoria, Daisy Bush (37°57′S, 145°00′E), 18 March 1926, 58c (ANIC; missing; legs except the left fore and mid legs; the antennae except a flagellum glued to the pin; head is split across frons and glued to body. Type label data differs from that published data. However, the specimen matches the description and is considered the holotype).

Holotype of *anexoneuroides*, ♀, Victoria, Gorae West (38°15′S, 141°30′E), 23 April 1952, C. Beauglehole (ANIC).

Other specimens examined (435♀♀, 70♂♂). Queensland: Wallangarra, Glen Aplin, Legume, Warwick, Brisbane, Crows Nest, Maclagan, Bunya Mts, Chinchilla, Amby, Kingaroy, Charleville, Mungallala, Morven, Blackall, Clermont, Middleton.

New South Wales and Australian Capital Territory: Mt Kosciusko, Mt Gingera, Brindabella Range, Canberra, Bowning, Mt Keira, Rydalmere, Narooma, Armidale, Ebor, Woollahra, Legume, Woodenbong.

Victoria: Lorne, Langwarrin, Brighton, Newport, Melbourne, Warburton, Bruthen, Gordon, Lake Mountain, Omeo, Bogong Plains, Falls Creek, Bendigo, Mt Buffalo.

Tasmania: Melaleuca, Hastings, Keoghs Road, The Lea, Mt Wellington, Hobart, Frodshams Pass, Maydena, Mt Mueller, Tarraleah, Franklin River, Mt Alma, Swansea, Derwent Bridge, Queenstown, Strahan, Breona, Tullah, Cradle Mt, Meredith River, Blessington, Launceston, Weldborough, Waratah.

South Australia: Mt Gambier, Millicent, Adrossan, Victor Harbour, Gawler Ranges, Nonning, Penong, Wilpena, Parachilna. Northern Territory: Kulgera, Simpsons Gap, Alice Springs, Corroboree Rock, Mt Solitaire, Barrow Creek.

Western Australia: Kojonup, Norseman, Balladonia, McDermid Rock, Kalamunda, Eucla, Yellowdine, Southern Cross, Boorabbin Rock, Boondi, Coolgardie, Jurien Bay, Mingenew, Thunderlarra HS, Leonora, Youanmi, Weld Range, Glenayle HS, Newman.

Diagnosis. Most like *L. erythrurum*. Female with head and propodeum black, mesoscutum dull, metallic, dark green with blue to copper tinge, metasoma black or with dark red-brown on posterior half of tergites, frons striate, mesoscutum openly to closely punctate, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral angular carinae, fore tibial spur fan shaped; BP rounded. Male with body black, antennae long (FL 1.6 × UID), AS4:AS2+3=1, S2–S4 with sparse cover of posteriorly directed, plumose hair across sternites, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.08–5.16 mm ($\bar{x}$=4.54 mm, SD=0.33, n=10), head width 1.22–1.53 mm (n=10), forewing length 0.96–1.36 mm ($\bar{x}$=1.18 mm, SD=0.12, n=10). Relative dimensions: HW 100, HL 82–85, UID 62–64, LID 60–61, AOD 20–22, IAD 12–13, OAD 32–34, IOD 21–23, OOD 16–18, CL 19–20, GW 20–22, EW 22–24, SL 36–37, FL 72–74.

Structure. Head triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.33 × LID), convex, more so along ventral margin and laterally, surface smooth and shining except anterior margin dull covered with fine reticulate pattern, openly punctate mesially with several deeply impressed punctures, laterally sparsely punctate with slightly smaller punctures, anterior margin openly punctate with small, rounded, shallow punctures, supraclypeal area raised, shining mesially, sparsely punctate with small shallow punctures. Frons (fig. 122A) striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to just beyond anterior margin of lateral ocelli. Labrum (fig. 122B) median basal area raised forming V-shaped tubercle, anterior margin rounded, margin raised forming lip, distal process triangular, widest at base, median keel distally spatulate, extends to margin, lateral ridges large and broad, dorsally smooth, basally recurved towards median keel, setae not present across distal margin, lateral teeth small, straight. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 122C) anterior margin rounded, punctation moderately coarse, surface shining, anteriorly impunctate, remainder openly to

closely punctate, midline weakly striate mesially. Scutellum length equal to length of dorsal surface of propodeum, surface dull, covered with reticulate pattern, openly punctate except closely punctate along midline. Dorsal surface of propodeum (fig. 122C) defined by posterolateral angular carinae set well below dorsal level, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate with a few striae laterally, sculpture almost reaches dorsal rim mesially, not laterally, dorsal rim with a dull sheen, gently rounded. T1 densely punctate except posterior marginal area impunctate. Mesepisternum lower half shining though with a fine reticulate pattern, upper half striate, metepisternum dull, striate. Fore tibial spur fan-shaped; BP rounded.

Colour. Head and propodeum black, mesoscutum dull, metallic, dark green with blue to copper tinge, metasoma black or with dark red-brown on posterior half of tergites, antennal flagellum brown underneath.

Vestiture. Frons with sparse, erect, minutely branched hair, paraocular areas with similar adpressed hair, mesoscutum almost glabrous, with a few erect, branched hairs, metasomal tomentum absent.

Description of male. Body length 3.54–4.16 mm ($\bar{x}$=3.82 mm, SD=0.20, n=10), head width 1.22–1.41 mm (n=10), forewing length 0.92–1.06 mm ($\bar{x}$=0.98 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 81–83, UID 65–67, LID 48–50, AOD 14–15, IAD 15–16, OAD 28–29, IOD 23–25, OOD 16–17, CL 18–20, GW 17–19, EW 29–31, ML 38–41, SL 23–24, FL 130–132.

Structure. Head triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute hair, clypeus weakly convex along posterior margin, surface smooth and shining, almost impunctate though with several minute punctures mesially, basal half dull white/yellow, supraclypeal area smooth and shining. Antennae moderately long (FL 1.6 × UID), AS4:AS2+3=1. Remainder as in female but with frons striate, pronotum dorsolateral angles rounded, weakly projected, mesoscutum anterior margin rounded, surface smooth and shining, sparsely to openly punctate with minute punctures, scutellum smooth, polished, impunctate, dorsal surface of propodeum not defined by carinae, sculpture weakly ruguloso-striolate, extending about half way to dorsal rim, rim smooth and shining; colour of body black, mandibles and clypeus as noted dull white/yellow, antennal flagellum light red-brown underneath, legs dark brown with fore, and mid tibiae and all tarsi light red-brown, hind tibiae suffused with light red-brown; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Lower frons and paraocular areas with dense cover of hair forming a mat, clypeus with some long hairs, mesoscutum almost glabrous, metasomal absent; S2–S4 with sparse cover of posteriorly directed, plumose hair across sternites.

Genitalia and associated sterna (figs 122E–H). Gonobase sides slightly flanged basally, gonocoxite without setae, gonostyli long, sparsely setose, retrorse lobes almost glabrous, well developed, ventral flanges present; S8 median process broadly rounded and setose apically, S7 median process narrow, parallel sided, rounded and setose apically.

Distribution (fig. 122D). Southern half of Australia in both the Eyrean and Bassian provinces.

Floral Forage Record. Families visited=9. Catch total=85; Campanulaceae (3 catches), Compositae (3), Fabaceae (7), Myoporaceae (10), Myrtaceae (56), Pittosporaceae (1), Proteaceae (2), Sapindaceae (2), Umbelliferae (1); Genera visited=20; *Acacia* (3), *Atalaya* (2), *Baeckea* (2), *Bursaria* (1), *Callistemon* (1), *Chrysanthemum* (1), *Conium* (1), *Daviesia* (1), *Eremophila* (10), *Eucalyptus* (36), *Grevillea* (1), *Hakea* (1), *Hypochoeris* (1), *Jacksonia* (3), *Leptospermum* (5), *Melaleuca* (10), *Taraxacum* (1), *Thryptomene* (1), *Tristaniopsis* (1), *Wahlenbergia* (3).

Flight Phenology.

39	20	8	5	4	0	0	5	13	27	28	20
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum mundulum is a member of the "erythrurum" species-complex and as with other members of this complex, the delineation of the specific characters is difficult. Frons, mesoscutum and dorsal surface of propodeum morphological characters are within the ranges of intraspecific variation noted for *L. erythrurum*. *Lasioglossum mundulum* may indeed be a synonym of *L. erythrurum*. However, due to the consistency of the mesosomal and metasomal colour differences, across the sympatric distribution of the two species, I have decided to retain *L. mundulum* as a valid species and await further analysis (such as electrophoretic or DNA) of the "*erythrurum*" species-complex.

Lasioglossum (Chilalictus) nefrens sp. nov.

Figures 7D, 9B, 11E, 17B, 123A–H

Material examined. Holotype. ♀, Queensland, 10 km S of Leyburn (28°06′S, 151°35′E), 6 Jan 1984, KLW, on *Eucalyptus* (NMV T-15765, missing left antenna.)

Paratypes (3♀♀, 6♂♂). Queensland 3♀♀, 2♂, same data as holotype (NMV; ♀♀ T-15766–15768; ♂♂ T-15769–15770), (one ♀ gold coated); 4♂♂, 15 km S of Leyburn (28°09′S, 151°35′E), 13 Nov 1979, KLW, on *Eucalyptus dealbata* (UQIC).

Diagnosis. Most like *L. edentulatum.* Both sexes with body black. Female with head square, genae visible in frontal view, frons striate, clypeus broadly recessed mesially, preapical teeth absent on mandibles, mesoscutum glabrous and highly polished, dorsal surface of propodeum ruguloso-striolate, defined posterolaterally, carinae curved to form raised ridge, fore tibial spur fan-shaped. Male with antennae long, S2–S4 with long, plumose hair, S4 hair directed posterolaterally forming V-shape along midline, genitalia retrorse lobes glabrous, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.54–6.78 mm ($\bar{x}$=6.67 mm, SD=0.12, n=3), head width 1.95–2.00 mm (n=3), forewing length 1.74–1.83 mm ($\bar{x}$=1.79 mm, SD=0.05, n=3). Relative dimensions: HW 100, HL 84–85, UID 57–58, LID 57–58, AOD 21–22, IAD 10–11, OAD 25–26, IOD 17–18, OOD 15–16, CL 19–20, GW 23–24, EW 24–25, SL 43–44, FL 73–75.

Structure. Head broad, square, vertex widened, genae enlarged, visible in frontal view, upper and lower margins of orbits parallel, median frontal carina extends to median ocellus, eyes with sparse cover of minute setae. Scape reaching at least anterior margin of lateral ocelli. Clypeus short (CL 0.34 × LID), broadly recessed mesially (fig. 7D), surface shining, sparsely to openly punctate with small punctures, supraclypeal area strong projected on upper half, shining, closely punctate. Frons (fig. 123A) striate above antennal bases, striae form V shape pattern along frontal carina, sculpture weakens laterally, extends to vertex. Vertex narrow behind ocelli, broadens laterally behind upper margins of eyes. Genae broad in side view, enlarged on upper half. Labrum (fig. 123B) median basal area slightly raised mesially, surface smooth with longitudinal groove length of raised area, anterior margin obtuse mesially, distal process short, equal to half length of basal process, distal process not tapered, widest at base, median keel extends well beyond distal margin, lateral ridges large, dorsally smooth, extend to margin, distal margin without setae across, lateral teeth large, slightly curved distally. Preapical teeth absent on mandibles (fig. 9B). Pronotum dorsolateral angles acute, well projected. Mesoscutum (fig. 123C) anterior margin with weakly bilobed mesial projection, punctation fine, surface highly polished, midline and parapsidal lines lightly impressed, sparsely punctate with indistinct punctures except closely punctate along posterior margin. Scutellum equal in length to dorsal surface of propodeum length , surface polished, sparsely punctate. Dorsal surface of propodeum (fig. 11E) defined posterolaterally with strong carinae set at dorsal level, carinae curved to form raised ridge, posterolateral corners angular, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate, sculpture not reaching rim, dorsal rim smooth, polished posteriorly. T1 densely punctate. Mesepisternum striate, metepisternum smooth. Fore tibial spur fan-shaped (fig. 17B); BP rounded.

Colour. Body black; clypeus, antennae, legs, posterior marginal areas of tergites brown.

Vestiture. Body sparse, paraocular areas with short, adpressed, minutely branched hair, frons with minute simple hair, clypeus and supraclypeal area almost glabrous, mesoscutum glabrous except white tomentum along posterior margin, metanotum with some tomentum along anterior margin, tomentum lateral on T2 and T3, across T4 and T5.

Description of male. Body length 4.70–5.85 mm ($\bar{x}$=5.11 mm, SD=0.46, n=6), head width 1.55–1.74 mm (n=6), forewing length 1.36–1.46 mm ($\bar{x}$=1.40 mm, SD=0.04, n=6). Relative dimensions: HW 100, HL 89–90, UID 58–59, LID 46–47, AOD 14–15, IAD 15–16, OAD 25–26, IOD 20–22, OOD 12–13, CL 20–21, GW 20–22, EW 30–32, ML 34–35, SL 32–34, FL 126–128.

Structure. Head broad, eyes appear bulbous, genae not visible in frontal view, inner orbits converge below, eyes with sparse cover of minute setae, clypeus flat, basal half with dull white marking, supraclypeal area projected on upper half, shining, scape not reaching median ocellus. Antennae moderately long (FL 2.17 × UID), AS4:AS2+3=1.1. Remainder of body similar to female but with mesoscutum shining, not highly polished, densely punctate in parapsidal areas, openly punctate mesially, dorsal propodeal carinae weaker than female, dorsal rim smooth mesially only, body colour similar to

female except clypeus; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Frons on lower half, paraocular areas, lateral and posterior margins of clypeus with short, adpressed plumose hair forming a mat, frons on upper half with short hair, posterior margin of mesoscutum with tomentum, metasomal tomentum absent, few short hairs laterally on T2; S2–S4 with long plumose hair across sterna, hair on S2 and S3 posteriorly directed, S4 hair directed posterolaterally, on either side of midline, forming V-shape along midline, S5 with short adpressed simple hair.

Genitalia and associated sterna (figs 123E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli broadened, with long plumose setae, retrorse lobes well developed, almost glabrous with few short setae around margins, ventral flanges present; S7 and S8 median processes elongate, apically rounded, S8 with branched setae.

Distribution (fig. 123D). Single locality (Leyburn) in southeastern Queensland.

Etymology. The epithet *nefrens* means "toothless" and refers to the lack of a preapical tooth on the mandible.

Floral Forage Record. Family visited. Catch total=2; Myrtaceae (2 catches). Genus visited, *Eucalyptus* (2).

Flight Phenology.

1	0	0	0	0	0	0	0	0	0	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The lack of a preapical tooth on the mandible also occurs in *L. edentulatum*.

Lasioglossum (Chilalictus) nigropolitum (Cockerell)

Figures 9D, 11F, 124A–D

Halictus nigropolitus Cockerell, 1929a: 3.
Lasioglossum (*Chilalictus*) *nigropolitum*. — Michener, 1965: 177.

Material examined. Holotype. ♀, Northern Territory, Port Darwin (12°27′S, 130°50′E), March 1912, Cockerell, BM 1933-567, BM Type Hym. 17.a.990 (BMNH, missing distal eight flagellar segments of left antenna.)

Other specimens examined (16♀♀). Queensland: Townsville, Cooktown, Laura.

Northern Territory: Cape Crawford, Mataranka, Katherine, Mary River, Darwin, Cahills Crossing, Arnhem Land.

Western Australia: Kununurra.

Diagnosis. Most like *L. brochum*. Body black. Female with frons elongate, sculpture striate, genae broad, labrum basal median area forming two tubercles, anterior margin forming raised lip, distal process tapered, smooth sided, mandibles with preapical tooth grossly enlarged, forming large, rounded boss, mesoscutum highly polished, openly punctate, dorsal surface of propodeum coarsely reticulate, defined by angular posterolateral carinae; fore tibial spur fan-shaped.

Description of female (male unknown). Body length 6.39–7.31 mm ($\bar{x}$=6.75 mm, SD=0.32, n=10), head width 1.86–2.01 mm (n=14), forewing length 1.55–1.72 mm ($\bar{x}$=1.62 mm, SD=0.07, n=14). Relative dimensions: HW 100, HL 84–86, UID 55–56, LID 54–55, AOD 19–20, IAD 10–12, OAD 28–29, IOD 19–20, OOD 10–11, CL 20–21, GW 19–20, EW 25–27, SL 35–36, FL 71–73.

Structure. Head broad, inner orbits slightly converging below, median frontal carina reaches median ocellus, lateral ocelli widely separated, lateral ocelli close to upper inner margin of eyes (IOD 2 × OOD), eyes sparsely covered with short setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.38 × LID), weakly convex, shining, openly to closely punctate, punctures rounded, supraclypeal area weakly projected, shining, closely to densely punctate. Frons (fig. 124A) elongate, sculpture striate above antennal bases, though striae sinuate, sculpture weakens laterally to smooth near orbits, extends vertically to anterior margin of lateral ocelli, vertex broad, with several, strong, transverse striae. Genae broad. Labrum (fig. 124B) basal median area raised forming two large rounded tubercles, anterior margin forming raised lip, distal process tapered, widest at base, median keel spatulate, not extending beyond distal margin, lateral ridges large, apically bulbous, set at oblique angle to median keel, median keel present, extend to distal margin, setae not across distal margin, lateral teeth absent, lateral margin smooth. Mandibles with preapical tooth grossly enlarged, forming large, rounded boss (fig. 9D). Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 124C) anterior margin rounded, punctation moderately weak, surface dull anteriorly with minute, transverse lines, remainder highly polished, openly punctate mesially, openly to closely punctate laterally, densely punctate along posterior margin. Scutellum 1.2 × longer than dorsal surface of propodeum, surface highly polished, appears impunctate, sparsely punctate

with minute punctures. Dorsal surface of propodeum (fig. 11F) defined by angular posterolateral carinae set well below dorsal level, carinae form distinct V-shaped projections, posterovertical carinae extend to dorsal carinae, dorsal sculpture coarsely reticulate on basal half only, striolate laterally, reaches rim laterally, dorsal rim smooth and polished. T1 densely punctate. Mesepisternum finely striolate, metepisternum almost smooth, few striae on upper half. Fore tibial spur fan-shaped (cf. Fig. 17B). BP obtuse.

Colour. Body black; mandibles red-brown apically, antennal flagella, and legs dark brown to black.

Vestiture. Body sparse; paraocular areas with a few long, minutely branched hairs, frons and mesoscutum with shorter, almost simple hair, metasomal tomentum absent.

Distribution (fig. 124D). Torresian province.

Floral Forage Record. Family visited = 1. Catch total = 6; Myrtaceae (6 catches). Genus visited, *Eucalyptus* (6).

Flight Phenology.

0	0	0	0	0	1	1	0	0	1	5	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Remarks. *Lasioglossum nigropolitum* is the only black, non-metallic species to occur throughout northern Australia. The other black, non-metallic Torresian species, *L. polygoni*, is restricted to coastal Queensland. *Lasioglossum nigropolitum* possesses a number characters usually associated with metallic species i.e. elongation of the frons, and labrum basal box with raised rounded tubercles and raised anterior margin forming a lip and distal process tapered, smooth sided with bulbous lateral ridges. In addition, the enlarged pre-apical tooth on the mandible is shared only with *L. brochum*. The northern habitat of this species is in areas prone to monsoons, therefore instead of soil nesting, as is usual for halictids, it may nest in wood and require the additional head and mandible enlargements.

Several large orbatid mites, located on the posterior margin of the propodeum, were found on a specimen from Kununurra, Western Australia. These mites did not occur on other *L. (Chilalictus)* species.

Lasioglossum (Chilalictus) nitens sp. nov.

Figures 13D, 125A–D

Material examined. Holotype, ♀, Western Australia, 8 km N of Ravensthorpe (33°31′S, 120°01′E), 2 Nov 1989, KLW, on *Melaleuca* (NMV T-15771).

Paratypes (20♀♀). Western Australia: 1♀, 40 km ENE of Caiguna (32°11′S, 125°44′E), 31 May 1986, R.P. McMillan (WAM 90/140); 1♀, Hatter Hill, 40 km NE of Lake King PO (32°49′S, 119°58′E), 29 Dec 1979, A.M. & M.J. Douglas, on mallee flowers (WAM 87/687); 2♀♀, 7 km S of Grass Pateh (33°17′S, 121°43′E), 31 Oct 1989, KLW, on *Melaleuca* (NMV T-15772–15773); 1♀, 18 km SSW of Grass Pateh (33°23′S, 121°41′E), 19–20 Sep 1981, IDN & JCC (ANIC); 5♀♀, 19 km SSW of Grass Patch (33°23′S, 121°40′E), 19–20 Sep 1981, IDN & JCC (ANIC); 4♀♀, Seaddan (33°27′S, 121°44′E), 26 Jan 1977, A.M. & M.J. Douglas, ABFR (WAM 87/649, 87/651–654); 4♀♀, same data as holotype (NMV T-15774–15777); 2♀♀, Gnowangerup (33°56′S, 118°00′E), 4 Mar, 4 Apr 1954, A.D. (NMV T-15778–15779).

Diagnosis. Most like *L. speculatum*. Female with body black, frons reticulate, clypeus with large deeply indented punctures, labrum with lateral ridges serrate; mesoscutum anterior margin projected mesially, weakly bilobed, punctation moderately coarse; dorsal surface of propodeum striate with striae mesially curved towards midline, defined by posterolateral carinae, posterovertical surface plicate.

Description of female (male unknown). Body length 7.32–8.39 mm ($\bar{x}$ = 7.89 mm, SD = 0.39, n = 10), head width 2.23–2.42 mm (n = 10), forewing length 2.09–2.40 mm ($\bar{x}$ = 2.27 mm, SD = 0.12, n = 10). Relative dimensions: HW 100, HL 82–83, UID 54–55, LID 50–52, AOD 19–20, IAD 10–11, OAD 24–25, IOD 16–17, OOD 12–13, CL 22, GW 16–18, EW 25–27, SL 41–43, FL 70–72.

Structure. Head wider than long, inner orbits converging below; median frontal carina reaches median ocellus; eyes with few minute setae. Scape reaching at least posterior margin of median ocellus. Clypeus relatively short (CL 0.42 × LID), weakly convex, closely punctured, with large, deeply indented punctures, clypeus and supraclypeal area smooth and shining, latter sparsely punctured with minute punctures. Frons (fig. 125A) reticulate above antennal bases, sculpture extends to anterior margin of lateral ocelli. Labrum (fig. 125B) basal median area raised to distal margin, surface roughened, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges serrate, extend to distal margin, lateral teeth present, large, distally hooked. Pronotum dorsolateral angles obtuse, projected. Mesoscutum (fig. 125C) anterior margin with weakly bilobed mesial projection, punctation moderately coarse, surface smooth and shining, mesially and in parapsidal areas closely to

densely punctured, mesiad of midline openly punctured. Scutellum length equal to dorsal surface of propodeum, surface shining, minutely punctured. Dorsal surface of propodeum (fig. 13D) defined by posterolateral carinae set well below dorsal level, posterovertical surface transversely plicate, carinae reach posterolateral carinae, dorsal surface shining, striate with striae mesially curved towards midline, sculpture not reaching rim. T1 shining and densely punctate. Mesepisternum and metepisternum coarsely striate; BP rounded.

Colour. Body shining black except mandibles red-brown apically, legs and flagellar segments brown.

Vestiture. Body sparse, face and mesoscutum with sparse erect branched brown hair, tomentum absent (few specimens with minute lateral tufts).

Distribution (fig. 125D). Western zone of the Bassian province.

Etymology. The epithet *nitens* means "shining" and refers to the lustre of the mesoscutum.

Floral Forage Record. Family visited=1. Catch total=3; Myrtaceae (3 catches). Genera visited=2; *Eucalyptus* (1), *Melaleuca* (2).

Flight Phenology.

1	0	1	1	1	0	0	0	2	1	1	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Intraspecific variation is restricted to body length and the presence of minute metasomal tomentose hair tufts.

Lasioglossum (Chilalictus) oblitum (Smith)

Figures 16E, 126A–D

Halictus oblitus Smith, 1879: 35.
Lasioglossum (*Chilalictus*) *oblitum*. — Michener, 1965: 177.

Material examined. Holotype, ♀, Western Australia, Swan River (31°45′S, 116°04′E), BM Hym Type 17.a.903 (BMNH, metasoma and left hind tarsi dislodged and glued to card.)

Other specimens examined (24♀♀). Victoria: Kiata. Western Australia: Cranbrook; Gnowangerup; Broomehill; Katanning; Scaddan; Hatter Hill; Norseman; Perth; Esperance.

Diagnosis. Like *L. helichrysi*. Female with body black, frons coarsely reticulate, mesoscutum surface shining, densely punctate, dorsal surface of propodeum ruguloso-striolate, weakly defined posterolaterally by carinae, T1 with large lateral hair tufts forming a mat.

Description of female (male unknown). Body length 6.31–7.85 mm ($\bar{x}$=7.42 mm, SD=0.43, n=10), head width 2.12–2.44 mm (n=10), forewing length 1.83–2.12 mm ($\bar{x}$=1.96 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 81–85, UID 59–61, LID 55–56, AOD 20–21, IAD 11–12, OAD 26–27, IOD 19–20, OOD 14–15, CL 19–21, GW 16–18, EW 23–24, SL 39–40, FL 73–75.

Structure. Head broad, inner orbits converging below, median frontal carina well developed, reaches median ocellus, eyes with sparse cover of minute setae. Scape reaching at least posterior margin of anterior ocellus. Clypeus short (CL 0.38 × LID), convex more so along ventral margin, surface highly polished, basal margin smooth with a few, deeply impressed punctures, anteriorly closely to densely punctate, supraclypeal area well projected, highly polished, openly punctate with minute punctures. Frons (fig. 126A) coarsely reticulate above antennal bases and laterally to inner margins of orbits, sculpture extends to at least posterior margin of lateral ocelli. Labrum (fig. 126B) basal median area raised, weakly nodulated, anterior margin almost straight, lateral margins slightly recessed, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges well developed, serrate, extends to margin, distal margin with setae across, lateral teeth large, distally hooked. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 126C) anterior margin with rounded mesial projection, anteriorly impunctate, dull with transverse lines, remainder densely punctate, surface shining, mesially punctures separated by smooth polished interspaces, in parapsidal areas punctures contiguous. Scutellum 1.4 × longer than dorsal surface of propodeum, surface shining, sparsely punctate mesially, densely punctate along midline and around margin. Dorsal surface of propodeum (fig. 126C) weakly defined by posterolateral carinae set well below dorsal level, posterovertical carinae reaches dorsal carinae, dorsal sculpture ruguloso-striolate mesially, striolate laterally, sculpture not reaching rim, dorsal rim broadly rounded, smooth and polished mesially. T1 densely punctate. Mesepisternum weakly striate, metepisternum almost smooth. BP rounded.

Colour. Body black; mandibles red-brown apically, antennae dark brown above, light brown beneath, legs brown.

Vestiture. Body sparse, frons and paraocular areas with erect, branched hair, mesoscutum with similar, shorter hair, T1 with large, lateral

tufts of short, adpressed plumose hair forming a mat (fig. 16E), lateral tomentum on T2–T4.

Distribution (fig. 126D). Western zone of the Bassian province. There is a single record from Kiata, Victoria and while I have no reason to doubt this record, the species has not since been recorded in Victoria.

Floral Forage Record. Families visited=2. Catch total=7; Myoporaceae (1 catch), Myrtaceae (6); Genera visited=2; *Eremophila* (1), *Eucalyptus* (6).

Flight Phenology.

1	0	0	0	0	0	0	0	0	1	2	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Although several species possess lateral hair tufts on T1, *L. oblitum* is the only one in which such tufts are present and the dorsal surface of the propodeum is defined by posterolateral carina. The hair structure of the tufts on five specimens was simple rather than plumose. The position and size of the simple hair tufts were similar to plumose hair tufts and as were all other morphological characters. Four specimens, with plumose hair tufts, carried numerous hypopial nymphal mites on the base of T1, although the tufts were not acarinaria as no mites were attached to, or between, the hair tufts.

Lasioglossum (Chilalictus) obscurissimum Michener

Figures 4D, 127A–H

Lasioglossum (Chilalictus) obscurissimum Michener, 1965: 315–316.

Material examined. Holotype. ♀, Queensland, Helidon (27°33′S, 152°08′E), 20 Oct 1958, C.D. Michener (ANIC, glued to pin.)

Other specimens examined (32♀♀, 12♂♂). Queensland: Stanthorpe, Inglewood, Warwick, Moonie, Helidon, Brisbane, Gurulmundi, Morven, Taroom.

New South Wales and Australian Capital Territory: Canberra, Nyngan, Coonabarabran, Girilambone, Coolabah, Gunnedah, Armidale, Moree.

Victoria: Quantong.

Diagnosis. Most like *L. gynochilum*. Both sexes black. Female with head conspicuously broad, frons striate, mesoscutum dull, covered with fine reticulate pattern, openly to closely punctate with small, rounded, shallow punctures, dorsal surface of propodeum striolate, not defined by carinae, T1 openly punctate. Male with clypeus black, antennae moderately short (FL 1.24 × UID), AS4:AS2+3=0.4, S2–S4 with short, erect, minutely branched hair extending across sternites though not reaching lateral margins, S5 with similar hairs aligned in crescent shape on either side of midline, S6 with a few, short, simple hairs; forewings with 2nd r-m as weaker than 1st r-m.

Description of female. Body length 4.54–5.39 mm ($\bar{x}$=4.83 mm, SD=0.25, n=10), head width 1.43–1.55 mm (n=10), forewing length 1.20–1.32 mm ($\bar{x}$=1.24 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 74–76, UID 67–68, LID 54–56, AOD 14–16, IAD 15–16, OAD 27–28, IOD 20–21, OOD 21–22, CL 19–20, GW 17–18, EW 26–28, SL 34–35, FL 60–63.

Structure. Head conspicuously broad (fig. 4D), clypeus barely projected below lower level of eyes, inner orbits converging below, median frontal carina extends about half way to median ocellus, eyes with sparse cover of minute setae. Scape reaching barely reaching anterior margin of median ocellus. Clypeus short (CL 0.35 × LID), convex, so basally, surface dull with reticulate pattern, appears impunctate, though with a few shallow, irregular depressions anteriorly, supraclypeal area weakly projected basally, dull, impunctate. Frons (fig. 127A) finely striate above antennal bases, sculpture laterally weakens to smooth, extends vertically to just beyond anterior margin of median ocellus. Labrum (fig. 127B) median basal area raised, nodulated, anterior margin rounded mesially, distal process not tapered, widest at base, median keel weakly spatulate, extends to distal margin, lateral ridges divided, each ridges consists of a small process originating near lateral margin, second small process near basally near median keel, setae not present across distal margin, distal setae originate submarginally, lateral teeth short, distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 127C) anterior margin rounded, punctation fine, surface dull, covered with fine reticulate pattern, anteriorly and in parapsidal areas impunctate, mesially openly to closely punctate with small, rounded, shallow punctures. Scutellum 1.4 × longer than dorsal surface of propodeum, surface dull, closely punctate with punctures similar to mesoscutum. Dorsal surface of propodeum (fig. 127C) not defined by carinae, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture weak, striolate across surface except a few interconnectives mesially, sculpture not reaching dorsal rim, rim bluntly angular. T1 openly punctate, posterior

marginal area impunctate. Mesepisternum and metepisternum finely striate on upper surface only, remainder smooth. BP rounded.

Colour. Head and mesosoma black, metasoma and legs brown to dark brown, mandibles red-brown apically, antennal flagellum brown above, light brown underneath.

Vestiture. Body sparse, frons and paraocular areas with short and long, minutely branched hair, clypeus with a few similar hairs and several long hairs along ventral margin, mesoscutum with short, adpressed, simple and long, erect, minutely branched hair, weak metasomal tomentum laterally on T2 and T3.

Description of male. Body length 3.85–4.62 mm ($\bar{x}$=4.27 mm, SD=0.24, n=10), head width 1.27–1.41 mm (n=10), forewing length 1.03–1.22 mm ($\bar{x}$=1.12 mm, SD=0.06, n=10). Relative dimensions: HW 100, HL 74–76, UID 62–63, LID 54–56, AOD 14–16, IAD 17–18, OAD 26–27, IOD 18–19, OOD 23–24, CL 19–20, GW 16–17, EW 28–30, ML 34–36, SL 30–31, FL 75–78.

Structure. Head conspicuously broad, eyes appear bulbous in side and frontal view, clypeus barely extends beyond lower level of eyes, convex basally, impunctate, entirely black, without yellow or white marking on basal half, supraclypeal area weakly projected, impunctate, fore tibial spur fan-shaped. Antennae moderately short (FL 1.24 × UID), AS4:AS2+3=0.4. Remainder of body similar to female except dorsolateral angles of pronotum not projected at all, mesoscutum appears impunctate though sparsely to openly punctate with small, rounded, shallow punctures, dorsal surface of propodeum sculpture striolate, dorsal rim smooth and shining, T1 sparsely punctate; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, paraocular areas with short, adpressed, plumose hair forming a mat on lateral margins of clypeus, upper paraocular areas and frons with semi-adpressed, plumose hair, metasoma with weak lateral tomentum on T2; S2–S4 with short, erect, minutely branched hair extending across sternites though not reaching lateral margins, S5 with similar hairs aligned in crescent shape on either side of midline, S6 with a few, short simple hairs.

Genitalia and associated sterna (figs 127E–H). Gonobase sides slightly flanged mesially, gonocoxite without setae, gonostyli long with sparse, short, simple setae except several long setae apically, retrorse lobes setose, well, developed, ventral flanges absent; S8 median process short, apically rounded, glabrous apically, few setae on lateral margins, S7 median process rounded, glabrous.

Distribution (fig. 127D). Eastern zone of the Bassian province, although more commonly collected in southern Queensland and northern New South Wales than in Victoria.

Floral Forage Record. Families visited=2. Catch total=16; Campanulaceae (15 catches), Myrtaceae (1); Genera visited=2; *Eucalyptus* (1), *Wahlenbergia* (15).

Flight Phenology.

3	3	1	0	0	0	0	0	4	7	4	5
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum obscurissimum is part of a species-complex whose members are often collected on *Wahlenbergia*. All are small, black, non-metallic species and males often have mesoventral processes. Although Michener (1965) provided a comprehensive and adequate description, the species is fully described here to provide uniformity of descriptions across all taxa.

Lasioglossum (Chilalictus) occidens sp. nov.

Figures 128A–H

Material examined. Holotype. ♀, Western Australia, Porongurup Nat. Pk (34°41′S, 117°54′E), 11 Oct 1970, D. Colless (ANIC).

Paratypes (31♀♀, 2♂♂). Western Australia: 9♀, 2♂, same data as holotype (ANIC); 1♀, 19 km N of Karridale (34°02′S, 115°06′E), 17 Nov 1989, KLW, on *Melaleuca* (NMV T-15780); 2♀♀, 4 km E of Karridale (34°12′S, 115°08′E), 17 Nov 1989, KLW, on *Eucalyptus* (NMV T-15781–15782); 3♀♀, Karridale (34°12′S, 115°06′E), 17 Nov 1989, KLW, on *Melaleuca* (NMV T-15783–15785); 1♀, 60 km SE of Waroona (33°21′S, 116°10′E), 9 Nov 1989, KLW, on *Eucalyptus* (NMV T-15786); 13♀♀, Donnelly River Xing on Pemberton-Nannup Rd (34°15′S, 115°56′E), 24 Dec 1966, EME, on *Eucalyptus* (UQIC); 1♀, 24 mi (38kms) NW of Walpole (34°53′S, 116°38′E), 7 Oct 1970, D.H. Colless (ANIC); 1♀, The Knoll, Walpole (34°59′S, 116°44′E), 25 Oct 1982, C.A. Howard & TFH, 500 (WAM 87/268).

Other specimens examined (25♀♀, 1♂). South Australia: Lake Newland.

Western Australia: Nornalup Nat. Pk, Albany, Crowea St. For., Nannup, Fitzgerald River Nat. Park, Mt Arid, Kojonup, Dingup, Ludlow, Bunbury, Collie, Mt Cooke, Hills.

Diagnosis. Most like *L. striatum*. Both sexes black. Female with frons coarsely reticulate/striate, mesoscutum mesially surface shining,

openly punctate, parapsidal areas dull, densely punctate, dorsal surface of propodeum sculpture alveolate, weakly striolate to ruguloso-striolate, not defined by carinae, T1 posterior half impunctate, BP bluntly obtuse. Male with antennae moderately long, AS4:AS2+3=1.2, T2–T5 impunctate, sternal hair sparse, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.31–7.85 mm ($\bar{x}$=7.04 mm, SD=0.44, n=10), head width 1.97–2.26 mm (n=10), forewing length 2.00–2.33 mm ($\bar{x}$=2.18 mm, SD=0.10, n=10). Relative dimensions: HW 100, HL 76–80, UID 56–57, LID 51–52, AOD 20–21, IAD 10–11, OAD 24–25, IOD 15–16, OOD 13–14, CL 20–21, GW 17–18, EW 24–25, SL 42–43, FL 81–82.

Structure. Head distinctly broadened, inner orbits converging below, median frontal carina reaches median ocellus, forming strong keel on upper portion of supraclypeal area, eyes with sparse cover of minute setae, appear bare. Scape reaches at least anterior margin of lateral ocelli. Clypeus short (CL 0.4 × LID), weakly convex, posteriorly with a dull sheen, surface coarsely roughened with large, irregularly shaped, deeply impressed punctures, anteriorly dull with fine reticulate pattern, closely punctate with small rounded shallow punctures, supraclypeal area projected, anterior half with dull sheen and several punctures, posteriorly dull and impunctate. Frons (fig. 128A) coarsely reticulate/striate above antennal bases, sculpture laterally weakens to striolate, extends vertically to anterior margin of median ocelli. Labrum (fig. 128B) basal median area raised, variously nodulated, anterior margin mesially rounded, distal process not tapered, widest at base, median keel extends beyond distal margin, lateral ridges large, coarsely serrate, extend to distal margin, setae not present across distal margin, distal setae distinctly longer than second last row of setae, lateral teeth large, distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 128C) anterior margin rounded, punctation moderately coarse, anteriorly impunctate with transverse lines, mesially surface shining, along midline closely punctate, with small rounded punctures, remainder of mesial area openly punctate with larger punctures, laterad of parapsidal lines and in parapsidal areas dull, densely punctate, several striae originating anterolaterally continue onto parapsidal areas. Scutellum 1.06 × longer than dorsal surface of propodeum, surface shining, along midline close to densely punctate, remainder openly punctate, all punctures minute. Dorsal surface of propodeum (fig. 128C) not defined by carinae, posterovertical carinae extend less than half way to dorsal level, dorsal sculpture weak, surface covered with fine alveolate pattern, mesially striolate to ruguloso-striolate, laterally striolate, sculpture extends to rim laterally, rim bluntly obtuse. T1 weakly punctate on anterior half, posterior half impunctate, covered with fine transverse lines. Mesepisternum and upper half of metepisternum finely striate, remainder smooth. BP bluntly obtuse.

Colour. Body black; mandibles red-brown apically, flagellum underneath and legs light brown to dark brown.

Vestiture. Body sparse, frons and paraocular areas with sparse, erect, weakly branched hair, clypeus and supraclypeal area almost glabrous, mesoscutum with short, branched hair, metasomal tomentum weak, laterally on T2 and T3.

Description of male. Body length 6.16–6.31 mm ($\bar{x}$=6.24 mm, SD=0.08, n=3), head width 1.83–1.91 mm (n=3), forewing length 1.79–1.88 mm ($\bar{x}$=1.83 mm, SD=0.05, n=3). Relative dimensions: HW 100, HL 82–83, UID 59–60, LID 43–44, AOD 15–16, IAD 14–15, OAD 27–28, IOD 20–21, OOD 15–16, CL 21–22, GW 15–16, EW 30–31, ML 35–37, SL 28–29, FL 151–153.

Structure. Head broad, inner orbits converging below, eyes almost bare, with a few minute setae, clypeus weakly convex, roughened with irregularly shaped shallow punctures, at least basal half pale white tinged with yellow, supraclypeal area well projected, median frontal carina forming strong keel on upper half, surface impunctate. Antennae moderately long (FL 2.48 × UID), AS4:AS2+3=1.2. Remainder of body similar to female except mesoscutum mesially sparsely to openly punctate, dorsal surface of propodeum distinctly ruguloso-striolate mesially, striolate laterally, T1 sparsely punctate anteromesially only, remainder impunctate, T2–T5 impunctate, colour similar to female except clypeus as noted and metasoma brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, frons and paraocular areas with erect, branched hair not forming a mat, metasomal tomentum absent, mesoventral area with dense, semi-adpressed branched hair; sternal hair sparse, S2 with long, branched hair across sternite, S3 with short, adpressed simple and branched hair, S4 and S5 with short, adpressed, minutely branched hair posterolaterally directed.

Genitalia and associated sterna (figs 128E–H). Gonobase sides flanged basally, gonocoxite setose on apical inner margin, retrorse lobes setose, well developed, ventral flanges present, gonostyli with long, branched setae on upper surface; S8 median process elongate, rounded, with simple setae apically, S7 median process rounded, glabrous.

Distribution (fig. 128D). Known from the western zone of the Bassian province, although there is one record from the Eyre Peninsula, South Australia.

Etymology. The epithet *occidens* refers to the species' predominantly western distribution.

Floral Forage Record. Families visited=2. Catch total=11; Myrtaceae (10 catches), Xanthorrhoeaceae (1). Genera visited=3; *Eucalyptus* (4), *Melaleuca* (6), *Xanthorrhoea* (1).

Flight Phenology.

1	1	0	2	0	0	0	0	0	6	10	5
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Females from the South Australian locality have the dorsal surface of the propodeum distinctly striolate mesially. Only one Western Australian specimen (Mt Cooke, WAM 87/497) has similar sculpture.

Lasioglossum (Chilalictus) ochrochilum sp. nov

Figures 129A–H

Material examined. Holotype. ♀, Western Australia, 1 km W of Boorabbin Rock (31°12′S, 120°17′E), 9 Jan 1985, TFH, 609-1, on flowers of *Eucalyptus leptopoda* (WAM 87/408).

Paratypes (22♀♀, 5♂♂). Western Australia: 7♀♀, Coorow (29°53′S, 116°01′E), 29 Oct 1935, R.E. Turner, BM 1935-240 (BMNH); 2♀♀, Dedari, 40 mi W of Coolgardie (30°57′S, 121°09′E), 11–21 Jan 1936, R.E. Turner (BMNH); 2♀♀, 449 km of Eastern Hwy (near Boondi) (31°11′S, 120°24′E), 1 Jan 1977, A.M. & M.J. Douglas, ABFA, swept from mallee (WAM 87/524-525); 1♂, same data as holotype (WAM 87/409); 1♂, Boorabbin Rock (31°12′S, 120°17′E), 20–21 Jan 1982, B. Hanich & TFH, 433-7, on *Thryptomene tuberculata* (WAM 84/853); 1♀, 21 km NE of Yellowdine (31°17′S, 119°53′E), 10 Oct 1981, IDN & JCC, on flowers of *Eucalyptus* (ANIC); 1♀, Yellowdine (31°18′S, 119°44′E), 21 Jan 1962, A.M. Douglas & L.N. McKenna (WAM 90/30); 1♀, 8 km S of Yellowdine (31°22′S, 119°44′E), 22 Oct 1974, C.A. & TFH, on flowers of *Grevillea* (SAM); 1♀, 5.5–6.5 km SW of McDermid Rock (32°01′S, 120°44′E), 27 Sep–3 Oct 1978, TFH et al. 210-1, on *Grevillea teretifolia* (WAM 87/49); 2♀♀, same collection details, 210-3, on *Daviesia aphylla* (WAM 87/44, 87/49); 1♀, 118 km E of Hyden on Norseman Road (32°27′S, 119°52′E), 24 Oct 1985, TFH, 627-1, on flowers of *Grevillea hookerana* (WAM 87/64); 1♀, 2♂♂, 1.5 mi N of Pinjarra (32°38′S, 115°52′E), 20 Dec 1966, EME, on *Melaleuca* (UQIC); 1♂, 60 km S of Norseman (33°05′S, 121°34′E), 2 Jan 1977, A.M. & M.J. Douglas, on mallee (WAM 87/531); 4♀♀, Frank Hann N.P., 56 km E of Lake King (33°05′S, 120°18′E), 19 Nov 1989, KLW, on *Eucalyptus* (NMV T-15787–15790).

Other specimens examined (8♀♀). South Australia: Box Flat.

Western Australia: Bunbury.

Diagnosis. Like *L. albopilosum* and *L. bicolor.* Female with head and mesosoma black, metasoma light red-brown except, basal margin of clypeus light red-brown, frons striate, mesoscutum densely punctate, dorsal surface of propodeum ruguloso-striolate, weakly defined by posterolateral carinae set well below dorsal level. Male with colour similar to female except metasoma and legs brown, antennae moderately short, AS4:AS2+3=0.65, S2–S4 with long, plumose, posteriorly directed hair, S4 mesial hair slightly shorter than lateral hair; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 5.16–5.93 mm ($\bar{x}$=5.64 mm, SD=0.23, n=10), head width 1.57–1.83 mm (n=10), forewing length 1.27–1.53 mm ($\bar{x}$=1.43 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 82–83, UID 57–58, LID 51–53, AOD 19–20, IAD 11–12, OAD 30–31, IOD 20–21, OOD 13–15, CL 20–21, GW 16–17, EW 27–28, SL 38–39, FL 65–67.

Structure. Head elongate, distinctly triangular, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.39 × LID), weakly convex, surface shining, ventromesially with a few large, deeply impressed, irregularly shaped punctures, posterolaterally smooth and impunctate, anteriorly openly punctate with rounded punctures, supraclypeal area weakly projected, openly punctate, surface with a dull sheen. Frons (fig. 129A) striate above antennal bases, sculpture laterally weakens to sparsely punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 129B) median basal area raised, nodulated with nodules joined forming raised inverted V-shaped ridge, anterior margin rounded mesially, forming weakly raised lip, lateral areas weakly recessed, distal process tapered, widest at base, median keel spatulate, extends to distal margin,

lateral ridges prominent, dorsally smooth, ridges extend to margin, setae present across distal margin, lateral teeth absent. Pronotum dorsolaterally rounded, moderately projected. Mesoscutum (fig. 129B) anterior margin with weakly bilobed mesial projection, surface with a dull sheen, punctation moderately coarse, anteriorly impunctate, with fine transverse lines, remainder densely punctate, punctures along midline almost contiguous, mesially with distinct interspaces present, in parapsidal areas punctures contiguous. Scutellum 1.1 × longer than dorsal surface of propodeum, surface shining, along posterior margin and midline densely punctate, remainder almost impunctate. Dorsal surface of propodeum (fig. 129C) weakly defined by posterolateral carinae set well below dorsal level, posterovertical carinae reaches dorsal carinae, dorsal sculpture ruguloso-striolate except a few striae laterally, sculpture not reaching rim, dorsal rim rounded, with a dull sheen. T1 densely punctate except impunctate along posterior marginal area. Mesepisternum and metepisternum weakly striate. BP rounded.

Colour. Head and mesosoma black, metasoma light red-brown except, ventral margin of clypeus light red-brown, mandibles red-brown apically, legs brown except fore and mid tibiae and tarsi suffused with light red-brown.

Vestiture. Body sparse, frons with short, semierect, simple and minutely branched hair, paraocular areas with erect, branched hair, clypeus and supraclypeal area almost glabrous, mesoscutum with distinct hair pattern, hair short, white, minutely branched, mesial hair directed laterally on either side of midline, parapsidal hair mesially directed, both sets of hair meet just mesiad of parapsidal line forming a hair ridge, dense hair along posterior margin, weak lateral tomentum on T2 only.

Description of male. Body length 4.62–5.08 mm ($\bar{x}$=4.85 mm, SD=0.17, n=5), head width 1.43–1.53 mm (n=5), forewing length 1.15–1.29 mm ($\bar{x}$=1.19 mm, SD=0.06, n=5). Relative dimensions: HW 100, HL 84–85, UID 59–60, LID 45–46, AOD 15–16, IAD 15–16, OAD 28–30, IOD 23–24, OOD 12 — 13, CL 19 — 20. GW 18 — 19, EW 30–31, ML 32–33, SL 28–29, FL 102–104.

Structure. Head triangular, inner orbits converging below, eyes with sparse cover of minute setae, scape not reaching median ocellus, clypeus weakly convex, surface shining, sparsely punctate, basal half pale yellow, supraclypeal area weakly projected, surface shining. Antennae moderately short (FL 1.7 × UID), AS4:AS2+3=0.65. Remainder of body similar to female but with frons weakly striate/reticulate, mesoscutum closely punctate mesially, surface polished, hair pattern absent except weak hair tuft along posterior margin, dorsal surface of propodeum not defined posterolaterally by carinae, body colour similar to female except metasoma and legs brown, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Frons, paraocular areas and anterior margin of clypeus with short, adpressed, branched hair forming a mat, metasoma without tomentous hair, S2–S4 with long, plumose, posteriorly directed hair, S4 mesial hair slightly shorter than lateral hair, S5 with sparse, adpressed, branched hair.

Genitalia and associated sterna (fig. 129E–H). Gonobase sides flanged basally, gonocoxite setose on apical inner margin, gonostyli moderately short, with simple and branched hair on upper surface, retrorse lobes setose, well developed, ventral flanges absent, lobes setose; S8 median process elongate, truncate apically, setose, S7 median process apically rounded, setose.

Distribution (fig. 129D). Western zone of the Bassian province.

Etymology. The epithet *ochrochilum* means "light red-brown lip" and refers to the colour of the clypeus in the female.

Floral Forage Record. Families visited=3. Catch total=12; Fabaceae (1 catch), Myrtaceae (7), Proteaceae (4); Genera visited=6; *Daviesia* (1), *Eucalyptus* (5), *Grevillea* (3), *Hakea* (1), *Melaleuca* (1), *Thryptomene* (1).

Flight Phenology.

7	0	0	0	0	0	0	0	2	6	2	2
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Conspecificity of coastal specimens (Pinjarra) with dry inland specimens (Boorabbin Rock) was confirmed by examination of genitalia. The series of specimens from Bunbury (AM) has not been included in the paratype series as these specimens are slightly darker than the dry inland specimens although they have the colour patterns of the Pinjarra female specimen. The similarity of morphological characters (labrum, sculpture and vestiture) suggests conspecificity.

Lasioglossum (Chilalictus) ochroma sp. nov.

Figures 7C, 130A–H

Material examined. Holotype. ♀, New South Wales, 36 km W of Cobar (31°30′S, 145°32′E), 11 Dec 1976, EME & T. Low, on *Atalaya hemiglauca* (QM T13910).

Paratypes (52♀♀, 34♂♂). Queensland: 1♀, Lake Moondarra, near Mt Isa (20°36′S, 139°33′E), 20 Mar 1973, EME, on *Eucalyptus brevifolia* (UQIC); 1♂, 6 km E of Charleville (26°24′S, 146°18′E), 23 Nov 1979, KLW, on *Eucalyptus populnea* (UQIC); 2♂♂, Morven (26°25′S, 147°07′E), 3 Nov 1971, EME, on *Eucalyptus* (UQIC); 4♂♂, Cunnamulla (28°04′S, 145°41′E), 27 Oct 1979, H.E. & M.A. Evans & A. Hook (UQIC).

New South Wales: 1♂ (29°51′S, 145°56′E), 28 km N of Bourke, 15 Dec 1976, EME & T. Low, on *Eucalyptus largiflorens* (UQIC); 2♂ same data as holotype. (UQIC).

Northern Territory: 17♀♀, 15♂♂, Devils Marbles (20°34′S, 134°16′E), 350m, 27 Oct 1962, E.S. Ross & D. Cavagnaro (CAS); 1♂, 15 km NW of Ross River Tourist Camp (23°35′S, 134°21′E), 20 May 1978, JCC (ANIC); 5♂♂, 11 mi (17.6 km) N of Alice Springs (23°37′S, 133°52′E), 625m, 28 Oct 1962, E.S. Ross & D. Cavagnaro (CAS).

Western Australia: 1♀, Spring Creek on Hwy 1 (16°49′S, 128°52′E), 26 Sep 1983, Schlinger & Irwin (NMV T-15791); 1♀, Karratha (20°44′S, 116°52′E), 31 Aug 1985, R.P. McMillan, on *Hibiscus panduriformis* (WAM 90/129); 2♀♀, 1♂, Millstream (21°35′S, 117°04′E), 24 Oct 1970, JCC, on *Eucalyptus* (ANIC); 32♀♀, Newman (23°22′S, 119°44′E), 21–24 Dec 1975, EME & R.I. Storey, on *Eucalyptus* (UQIC); 1♂, 73 mi (116.8 km) S of Onslow (23°46′S, 115°07′E), 22 Aug 1971, TFH, hovering around car wheel (SAM); 1♂, Tambrey (30°36′S, 115°39′E), 2 Aug 1958, R.P. McMillan, on *Acacia* flowers (WAM 87/455).

Diagnosis. Colour pattern unlike any other species. Both sexes pale yellow to light red-brown. Female with frons striate, mesoscutum smooth and shining, mesially openly to closely punctate, laterad of parapsidal lines almost impunctate, in parapsidal area densely punctate, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae set well below dorsal level. Male with antennae moderately long (FL 2.23 × UID), AS4:AS2+3=1, mandibles, clypeus, supraclypeal area, paraocular areas and lateral margins of pronotum bright yellow, S2–S4 with sparse cover minutely branched hair, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 4.47–5.62 mm ($\bar{x}$=5.07 mm, SD=0.39, n=10), head width 1.34–1.51 mm (n=10), forewing length 1.13–1.34 mm ($\bar{x}$=1.24 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 90–92, UID 57–58, LID 53–54, AOD 18–19, IAD 9–10, OAD 31–32, IOD 21–22, OOD 10–11, CL 21–22, GW 18–19, EW 31–32, SL 40–41, FL 81–83.

Structure. Head triangular, inner orbits converging below, median frontal carina reaches median ocellus, upper portion of carina weak, eyes with sparse cover of minute setae. Scape reaches well beyond anterior margin of median ocellus. Clypeus (fig. 7C) moderately long (CL 0.41 × LID), weakly convex, surface smooth and polished, with a few shallow, rounded, punctures anteriorly, minute punctures anteriorly, supraclypeal area smooth and polished, openly punctate with small, rounded, shallow punctures. Frons (fig. 130A) striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to just short of anterior margin of lateral ocelli. Labrum (fig. 130B) median basal area raised forming large, rounded tubercles, anterior margin rounded mesially, margin forming curved lip, distal process triangular, widest at base, median keel broad, extends to distal margin, lateral ridges large, dorsally smooth, recurved basally, setae not present across margin, lateral teeth absent. Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 130C) anterior margin rounded, surface smooth and shining, punctation fine, anteriorly impunctate, with a fine reticulate pattern, mesially openly to closely punctate, laterad of parapsidal lines almost impunctate, in parapsidal area densely punctate, all punctures small and shallow. Scutellum 1.25 × longer than dorsal surface of propodeum, surface smooth and shining, openly punctate with small, shallow punctures. Dorsal surface of propodeum (fig. 130C) defined by posterolateral carinae set well below dorsal level, carinae angular, posterovertical carinae reach posterolateral carinae, dorsal sculpture ruguloso-striolate with a few lateral striae, mesially sculpture almost reaches rim, dorsal rim smooth and polished, gently curved onto vertical surfaces. T1 densely punctate, posterior marginal area impunctate. Mesepisternum and metepisternum smooth and shining. BP rounded.

Colour. Entire body light red-brown in some specimens, others (including holotype) with clypeus tinged yellow mesially, frons, paraocular areas, mesepisternum and mesoventral area dark brown, dorsal surface of propodeum and metasoma tinged with brown.

Vestiture. Body sparse, clypeus and supraclypeal area almost glabrous, frons, paraocular areas and genae with conspicuous cover of short, plumose, adpressed hair (fig. 130A), meso-

scutum almost glabrous, mesepisternum with mat of adpressed, plumose hair and a few ereet, simple hairs, metasomal tomentum absent.

Description of male. Body length 3.46–4.16 mm ($\bar{x}$=3.85 mm, SD=0.21, n=10), head width 1.06–1.22 mm (n=10), forewing length 0.89–1.08 mm ($\bar{x}$=1.01 mm, SD=0.06, n=10). Relative dimensions: HW 100, HL 90–92, UID 60–61, LID 44–46, AOD 14–15, IAD 12–13, OAD 30–31, IOD 23–24, OOD 11–12, CL 23–24, GW 16–17, EW 36–37; ML 38–39, SL 29–30, FL 134–136.

Structure. Head triangular, inner orbits converging below, eyes with sparse cover of minute setae, scapes not reaching level of median ocellus, clypeus elongate, weakly convex mesially and laterally, entire surface bright yellow, supraclypeal area flat. Antennae moderately long (FL 2.23 × UID), AS4:AS2+3=1. Remainder similar to female, frons finely striate, pronotum dorsolateral angles rounded, not projected, mesoscutum smooth and polished, sparsely to openly punctate mesially, laterad of parapsidal lines impunctate, in parapsidal areas closely punctate, dorsal surface of propodeum not defined by carinae, smooth and highly polished, dorsal seulpture reduced to a few basal striae; eolour of mandibles, clypeus, supraelypeal area, paraocular areas and lateral margins of pronotum bright yellow (in some specimens lower frons yellow), frons dark brown, remainder of body light amber brown except legs dark yellow; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, lower frons and paraocular areas with conspicuous cover of short, adpressed plumose hair, remainder of body glabrous or with sparse hair cover; S2–S4 with sparse cover of rows of short, posteriorly directed minutely branched hair.

Genitalia and associated sterna (figs 130E–H). Gonobase sides parallel, gonocoxite without setae, gonostyli long, with long, branched setae apically, retrorse lobes almost glabrous, with a few setae ventrally, lobes well developed, ventral flanges present; S8 median process elongate, apically rounded and setose, S7 median process rounded glabrous.

Distribution (fig. 130D). Northern half of the Eyrean province.

Etymology. The epithet *ochroma* means "pale yellow" and refers to the general body colour.

Floral Forage Record. Families visited=4. Catch total=9; Fabaceae (1 catch), Malvaceae (1), Myrtaceae (6), Sapindaceae (1). Genera visited=4; *Acacia* (1), *Atalaya* (1), *Eucalyptus* (6), *Hibiscus* (1).

Flight Phenology.

0	0	1	0	1	0	0	3	1	5	2	3
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The colour patterns of *L. ochroma* are unique and *Homalictus rowlandi* (Cockerell) is the only other Australian halictid with somewhat similar colours (although may be easily separated on generic characters alone). There appears to have been confusion in identifying this species even to family as a number of specimens are labelled "Halictidae ?". The colour markings on the head, in particular those of the male, are more commonly associated with hylaeine or euryglossine bees (Colletidae).

The variable dark patterns on the mesoscutum are due to the transparent sclerite which allows the wing musculature to be clearly viewed.All specimens examined have been included in the paratype series to demonstrate the full range of colour variation in this species. A single male specimen (Charleville) shows macrocephaly with the genae produced at a right angle posteriorly rather than rounded.

Lasioglossum (Chilalictus) opacicolle (Cockerell)

Figures 15B, 29E, 31C, 131A–I

Halictus opacicollis Cockerell, 1914a: 519.
Halictus furneauxi Cockerell, 1915b: 100. syn. nov.
Lasioglossum (*Chilalictus*) *opacicolle*. — Michener 1965: 177.
Lasioglossum (*Chilalictus*) *furneauxi*. — Michener, 1965: 176.

Material examined. Syntype of *opacicollis*. ♀, Victoria, 7 Feb 1901, Turner, BM Type Hym 17.a.918 (BMNH, metasoma detached from propodeum and held in position by "gum" on the wings). Note: 2♀♀ syntype specimens with similar label data are lodged in USNM. R. McGinley (personal communication).

Holotype of *furneauxi*. ♀, Tasmania, Eaglehawk Neck (43°01′S, 147°55′E), 12 Feb–3 March 1913, R.E. Turner, BM Type Hym 17.a.930 (BMNH).

Other specimens examined (109♀♀, 18♂♂). New South Wales and Australian Capital Territory: Macquarie University, Mt Kosciusko, Clyde Mtn, Brindabella, Nerriga, Bulli Lookout, Narrow Neck, Mt Tomah, Bilpin, Mt Wilson, Kurrajong, Mt Kaputar Nat. Pk, Narrabri.

Victoria: Lorne, Gorae West, Pakenham, Mt Dandenong, Emerald, Ferntree Gully, Heathmont, Launching Place, Brisbane Ranges, King Lake, Marysville, Lake Mountain, Red Hill, Mt Rosea, Halls Gap, Grampians, McKenzie Falls, Little Desert.

Tasmania: Eaglehawk Neck, Mt Wellington, Hobart.

South Australia: Kangaroo Isiand, Mt Lofty, Athelstone.

Western Australia: Nornalup, Pemberton, Mingenew.

Diagnosis. Like *L. baudini*. Both sexes black. Female with frons striolate, mesoscutum anterior margin with weak mesial projection, surface dull, sparsely to openly punctate, parapsidal lines raised as prominent ridges, dorsal surface of propodeum weakly striolate, not defined by carina, T1 impunctate. Male with antennae moderately long, AS4:AS2+3=1, body similar to female, S3–S4 hair forming conspicuous lateral hair tufts, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.16–8.55 mm ($\bar{x}$=7.50 mm, SD=0.78, n=10), head width 1.83–2.16 mm (n=10), forewing length 1.83–2.42 mm ($\bar{x}$=2.16 mm, SD=0.20, n=10). Relative dimensions: HW 100, HL 82–85, UID 58–60, LID 56–57, AOD 20–21, IAD 10–11, OAD 26–27, IOD 16–17, OOD 14–16, CL 20–21, GW 16–18, EW 22–24, SL 42–43, FL 78–83.

Structure. Head broad, inner orbits weakly converging below, median frontal carina reaches median ocellus, carina forming raised keel on anterior portion of supraclypeal area, eyes sparsely covered with minute setae. Scape reaching anterior margin of lateral ocelli. Clypeus short (CL 0.37 × LID) weakly convex, basal half shining with a few large, deeply impressed punctures, openly to closely punctate, remainder dull, covered with a conspicuous reticulate pattern, sparsely to openly punctate with small, rounded punctures, supraclypeal area dull, covered with similar pattern, with several sparse, small rounded punctures. Frons (fig. 131A) weakly striolate above antennal bases, sculpture laterally smooth, extends vertically to anterior margin of median ocellus. Labrum (fig. 131B) basal median area raised, surface smooth basally, anterior margin obtuse, distal process not tapered, widest at base, median keel extends just beyond distal margin, lateral ridges absent, distal margin weakly notched, setae present across margin, lateral teeth large, distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 131C) anterior margin with weakly bilobed mesial projection, punctation fine, surface dull, covered with minute reticulate pattern, anteriorly impunctate, mesially sparsely to openly punctate, laterad of parapsidal lines openly punctate, parapsidal areas indistinctly openly to closely punctate, parapsidal lines raised as prominent ridges. Scutellum length equal to dorsal surface of propodeum, surface dull, sparsely to openly punctate. Dorsal surface of propodeum (fig. 15B) not defined by carina, posterovertical carinae extend greater than halfway to dorsal level, dorsal sculpture weakly striolate, with a few interconnectives, sculpture just short of rim, surface dull, entirely micro-alveolate. T1 impunctate, covered with minute transverse lines. Mesepisternum and metepisternum smooth except a few weak striae on upper portion. BP rounded.

Colour. Body black; mandibles dark red-brown, clypeus, legs and metasoma with brown tinge.

Vestiture. Body sparse, face and mesoscutum with erect, minutely branched, dark brown to black hair, mesoscutal hair shorter, tomentum laterally on T2, across T3 and T4.

Description of male. Body length 6.01–6.24 mm ($\bar{x}$=6.14 mm, SD=0.12, n=10), head width 1.69–1.76 mm (n=10), forewing length 1.72–1.76 mm ($\bar{x}$=1.73 mm, SD=0.02, n=10). Relative dimensions: HW 100, HL 85–86, UID 62–64, LID 48–49, AOD 18, IAD 13–14, OAD 25–26, IOD 18–19, OOD 17–18, CL 23–24, GW 12–14, EW 30–31; ML 39–40, SL 30–31, FL 148–151.

Structure. Head broad, inner orbits converging below, eyes sparsely covered with minute setae, clypeus weakly convex, basal half shining, surface weakly roughened, pale white-yellow marking on at least basal half, remainder brown, supraclypeal area well projected, sparsely punctate, frons sculpture similar to female. Antennae moderately long (FL 2.36 × UID), AS4:AS2+3=1. Remainder of body similar to female except mesoscutal punctation weaker, scutellum polished, sparsely punctate, colour similar to female except legs and metasoma brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, frons with sparse, short, erect hair, paraocular areas with short, semi-adpressed plumose hair, lower margins of paraocular areas hair forming weak mat, clypeus and supraclypeal area almost glabrous, metasomal tomentum absent, S2–S4 with long, minutely branched posterolaterally directed hair, S3 and S4 with long lateral hair forming conspicuous lateral tufts, S5 and S6 with sparse, short, minutely branched hair (fig. 29E).

Genitalia and associated sterna (figs 131E–I).

Gonobase sides parallel, gonocoxite with lateral setae only, gonostyli grossly swollen apically and flexed to act as shield above gonocoxite (figs 31C, 131I), setae long and branched, retrorse lobes setose, bifurcate, ventral portion setose, fused to inner margin of gonocoxite, ventral flanges present as elongate, separated lobe, penis valve weakly flanged apically and basally; S8 median process shape rounded, with simple setae apically and a few setae on lateral margins, S7 median process rounded, glabrous.

Distribution (fig. 131D). Eastern and western zones of the Bassian province.

Floral Forage Record. Families visited=5. Catch total=11; Compositae (1 catch), Epacridaceae (1), Fabaceae (7), Labiatae (1), Myrtaceae (1); Genera visited=9; *Acacia* (1), *Dillwynia* (1), *Leptospermum* (1), *Leucopogon* (1), *Phyllota* Benth. (1), *Platylobium* (1), *Prostanthera* (1), *Pultenaea* (3), *Richardia* (1).

Flight Phenology.

0	2	5	1	3	0	0	0	8	29	8	7
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Clinal variation is evident in the eastern states, with smaller specimens in the south. Western Australian specimens are still smaller.

Lasioglossum (Chilalictus) orbatum (Smith)

Figures 10E, 24B, 29F, 31A, 31B, 132A–H

Halictus orbatus Smith, 1853: 58–59.
Halictus viridarii Cockerell, 1930: 42. syn. nov.
Lasioglossum (*Chilalictus*) *orbatum*. — Michener, 1965: 177.
Lasioglossum (*Chilalictus*) *viridarii*. — Michener, 1965: 177.

Material examined. No type material could be located for *Halictus orbatus*. (Should be lodged in BMNH, absence confirmed by Mr. G. Else.)

Holotype of *viridarii*, ♂, Queensland, National Park (28°15′S, 152°58′E), Dec 1919, H. Hacker, QM Type No. Hy/4038 (QM).

Other specimens examined (288♀♀, 192♂♂). Queensland: Wallangarra, Emu Vale, Glen Aplin, Stanthorpe, Liston, Amiens, Warwick, Boonah, Cunninghams Gap, Brisbane, Mt Tamborine, Ipswich, Cotton Vale, Gatton, Stradbroke Is, Dalby, Tibrogargan Ck, Beerwah, Caloundra, Killarney, Coolum, Gympie, Cooloola, Fraser Island, Fraser Is.

New South Wales and Australian Capital Territory: Nadgee Reserve, Bemboka, Brown Mtn, Batemans Bay, Dubbo, Clyde Mt, Braidwood, Canberra, Black Mtn, Browning, Nowra, Blue Mts, Camden, Cowra, Lane Cove, Glenbrook, Epping, Bilpin, Patonga, Mt Wilson, Clarence, Howes Valley, Gunnedah, Narrabri, Robertsone, Uralla, Armidale, Mt Kaputar, Ben Lomond, Wallangarra, Tooloom, Legume, Woodenbong, Roseville.

Victoria: Tidal River, Apollo Bay, Wecaproinah, Beech Forest, Otway Range, Melbourne, Loch Valley, Mt Donna Buang, Dunkeld, Healesville, Cann River, Buchan, Genoa, Creswick, Mt Macedon, Buldah, Gelantipy, Merrijig, Omeo, Dinner Plain, Harrietville, Bendigo.

Tasmania: Nubeena, Hobart, Frodsham Pass, Fingal Valley, Rowella, Scottsdale, Winnaleah, Herrick.

South Australia: Orroroo.

Diagnosis. Most like *L. clelandi*. Both sexes with body black. Female with frons striate, clypeus flat mesially, supraclypeal area confluent with clypeus or weakly bulbous, labrum with lateral ridges absent, mesoscutum punctation conspicuously coarse, dorsal surface of propodeum with posterolateral areas flanged at dorsal level. Male with antennae moderately long, sterna almost bare, few short simple hairs; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.78–9.32 mm ($\bar{x}$=8.64 mm, SD=0.41, n=10), head width 2.14–2.63 mm (n=10), forewing length 2.00–2.30 mm ($\bar{x}$=2.20 mm, SD=0.07, n=10). Relative dimensions: HW 100, HL 75–76, UID 61–62, LID 57–59, AOD 21–22, IAD 10–11, OAD 25–26, IOD 16–17, OOD 16, CL 20, GW 14–15, EW 22–23, SL 40–41, FL 62–64.

Structure. Head broadly triangular, inner orbits converging below, median frontal carina well defined, extends to median ocellus, eyes with moderate cover of short setae. Scape reaches at least anterior margin of lateral ocelli. Clypeus relatively short (CL 0.38 × LID), almost flat mesially (some specimens weakly concave mesially), convex basally, surface shining, closely to densely punctured with irregular punctures (some specimens forming longitudinal grooves mesially), supraclypeal area almost confluent with clypeus or weakly bulbous, concave mesially, closely to densely punctate with small, elliptical punctures. Frons (fig. 132A) striate above antennal bases, sculpture laterally becomes ruguloso-striolate, extends vertically to posterior margin of eyes. Labrum (fig. 132B) basal median area median area raised to distal margin, surface roughened with raised carina apically, distal process flanged distally, median keel weakly spatulate, extends beyond distal margin, lateral ridges absent, lateral teeth present, small teeth, not hooked. Pronotum dorsolateral angles obtuse, projected. Mesoscutum (fig. 132C) anterior margin with weakly bilobed mesial projection, punctation conspicuously

coarse, surface dull except on posterior half, mesiad of midline, interspaces between punctures shining, anteriorly with transverse lineolation, mesially and laterad of parapsidal lines densely punctate, mesiad of midline openly to closely punctate with slightly larger punctures, parapsidal areas shining, openly to closely punctate. Scutellum 1.3 × longer than dorsal surface of propodeum, punctation minute, close to dense. Dorsal surface of propodeum (fig. 10E) defined by carinae, posterolateral areas flanged at dorsal level, sculpture weak, rugulosostriolate mesially, smooth in posterolateral areas, striolate laterally, sculpture reaching rim mesially and laterally. T1 densely punctate. Mesepisternum coarsely striate, metepisternum weakly striate on upper half, remainder smooth; BP rounded.

Colour. Body black; mandible red-brown, antennal flagellum and legs brown, metasoma tinged with brown.

Vestiture. Body sparse; Head with long, erect, branched hair except clypeus and supraclypeal almost bare, few small, simple hairs; mesoscutum sparsely covered with erect, brown, minutely branched hair; tomentum well developed on T2–T4.

Description of male. Body length 6.31–7.47 mm ($\bar{x}$=6.85 mm, SD=0.32, n=10), head width 1.83–2.23 mm (n=10), forewing length 1.64–1.97 mm ($\bar{x}$=1.78 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 80–82, UID 61–62, LID 46–47, AOD 15–16, IAD 11–13, OAD 23–25, IOD 18–19, OOD 16, CL 20–23, GW 17–18, EW 27–28; ML 37–38, SL 25–27, FL 123–125.

Structure. Head broad, inner orbits converging below, eyes sparsely covered with minute hair, clypeus with pale yellow marking on at least basal half, sculpture similar except clypeus shining, openly punctured with elliptical punctures. Antennae moderately long (FL 2.02 × UID), AS4:AS2+3=1. Remainder of body similar to female except mesoscutal punctation mesiad and laterad of parapsidal line dense, mesiad of parapsidal lines with interspaces shining, propodeum not defined by carinae, sculpture similar, posterior mesoventral area with distinct groove (fig. 24B); forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse. metasoma with only short hair, hairless appearance except for tomentum on T2 and T3, paraocular areas with dense cover of adpressed, branched hair, mesoventral area with minute, adpressed hair, sterna almost bare, few short, simple hairs (fig. 29F).

Genitalia and associated sterna (figs 132E–H). Gonobase sides weakly flanged, gonocoxite with several setae on apical inner margin, gonostyli ventral surface with sparsely covered with short, simple setae, dorsal surface with dense cover of elongate, branched setae, retrorse lobes, setose, well developed, ventral flanges present; S8 median process elongate, truncate, simple setae, S7 median process rounded, glabrous.

Distribution (fig. 132D). Eastern zone of the Bassian region.

Floral Forage Record. Families visited=7. Catch total=48; Campanulaceae (4 catches), Compositae (3), Fabaceae (25), Iridaceae (1), Myrtaceae (13), Pittosporaceae (1), Verbenaceae (1); Genera visited=17; *Acacia* (1), *Aotus* (2), *Bursaria* (1), *Daviesia* (4), *Eucalyptus* (9), *Helipterum* (1), *Jacksonia* (13), *Leptospermum* (4), *Medicago* (1), *Olearia* Moench. (1), *Pultenaea* (1), *Senecio* (1), *Swainsona* (1), *Trifolium* (2), *Verbena* L. (1), *Wahlenbergia* (4), *Watsonia* (1).

Flight Phenology.

16	20	6	6	1	1	0	18	32	26	34	17
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Although the type is lost, there is no confusion over the identification and it is not necessary to erect a neotype. This species is more common at higher altitudes and in cooler climates.

Lasioglossum (Chilalictus) pachycephalum (Cockerell)

Figures 133A–H

Halictus pachycephalus Cockerell, 1916b: 369.

Halictus dolichocerus Cockerell, 1916b: 370. syn. nov.

Halictus lanariellus Cockerell, 1916b: 373. syn. nov.

Lasioglossum (Chilalictus) pachycephalum. — Michener, 1965: 177.

Lasioglossum (Chilalictus) dolichocerum. — Michener, 1965: 176.

Lasioglossum (Chilalictus) lanariellum. — Michener, 1965: 176.

Material examined. Holotype of *pachycephalus.* ♂, New South Wales, Yarrawin (30°16′S, 147°13′E), W.W. Froggatt, 1914, 250c, BM Type Hym 17.a.986 (BMNH, missing antennae and right fore wing.)

Holotype of *dolichocerus.* ♂, New South Wales, Yarrawin (30°16′S, 147°13′E), W.W. Froggatt, 225c. USNM Type No. 58176 (USNM).

Holotype of *lanariellus*. ♀, New South Wales, Yarrawin (30°16′S, 147°13′E), W.W. Froggatt, 233c, BM Type Hym. 17.a.958 (BMNH, right fore and mid tarsi missing distal three and two segments respectively.)

Other specimens examined (40♀♀, 70♂♂). Queensland: Toobeah, Weengallon, George, Helidon, Fernvale, Amby, Miles, Dulacca, Mitchell, Morven, Charleville, Quilpie, Taroom, Eidsvold, Blackall, Emerald, Yeppoon, The Lynd, Mt Garnet, Atherton, Mt Lewis.

New South Wales and Australian Capital Territory: Caldwell, Wentworth, Gilgandra, Warren, Mt Boppy, Yarrawin, Nyngan, Narrabri, Bourke, Moree, Goondiwindi.

Victoria: Polkemmet Bridge.

South Australia: Tintinara, Wilpena, Copley.

Diagnosis. Most like *L. chapmani*. Both sexes with body black. Female with frons reticulate, mesoscutum polished, punctation moderately coarse, dorsal surface of propodeum rugulosostriolate defined by strong posterolateral carinae, dorsal rim smooth and highly polished, T1 with tinge of blue. Male with antennae moderately long, dorsal surface of propodeum not defined by carinae, legs light red-brown except coxae and trochanters black to dark brown, S2–S3 with dense plumose hair, S4 with similar cover except rows with mesial gap; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.08–8.47 mm ($\bar{x}$=7.72 mm, SD=0.39, n=10), head width 2.28–2.42 mm (n=20), forewing length 1.81–2.07 mm ($\bar{x}$=1.91 mm, SD=0.08, n=20). Relative dimensions: HW 100, HL 77–78, UID 60–61, LID 54–56, AOD 20–22, IAD 10–12, OAD 23–24, IOD 18–19, OOD 14–16, CL 18–20, GW 15–18, EW 23–24, SL 39–40, FL 68–70.

Structure. Head broad, inner orbits converging slightly below, median frontal carina well developed, extends to median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of lateral ocelli. Clypeus short (CL 0.35 × LID), weakly convex, shining except along anterior margin dull, ventral margin irregularly roughened, remainder closely punctate with large, deep, circular punctures, supraclypeal area projected, shining and openly punctate except dull around margin and densely punctured, punctures smaller than on clypeus. Frons (fig. 133A) reticulate above antennal bases and laterally to inner margin of orbits, sculpture extends vertically to posterior margin of lateral ocelli. Labrum (fig. 133B) basal median area raised sculpture smooth with weak nodulations, anterior margin obtuse mesially, distal process not tapered, widest at base, lateral ridges weakly serrate, almost extend to distal margin, margin without setae across, lateral teeth large, some distally hooked. Pronotum dorsolateral angles obtuse, projected. Mesoscutum (fig. 133C) anterior margin with mesial projection, in some specimens the projection is weakly bilobed, punctation moderately coarse, surface shining except anterior margin dull, along midline densely punctured, openly to closely punctate mesially, densely punctate in parapsidal areas and along posterior margin. Scutellum 1.2 × longer than dorsal surface of propodeum, shining, sparsely punctured except along midline and around margin. Dorsal surface of propodeum (fig. 133C) defined by strong posterolateral carinae set well below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal sculpture mesially ruguloso-striolate, laterally striolate, sculpture not reaching rim, dorsal rim rounded onto vertical surface, smooth and highly polished. T1 densely punctured. Mesepisternum coarsely and roughly striate, metepisternum striate on upper half, remainder smooth. BP rounded.

Colour. Body black; mandibles red-brown apically, antennae and legs light to dark brown, T1 anteriorly tinged blue, other tergites tinged of brown.

Vestiture. Body sparse, paraocular areas, and mesoscutum with sparse, erect, branched hair, frons hair shorter, minutely branched; propodeal sides and pleura with some long, plumose hair, tomentum laterally on T2, across T3 and T4.

Description of male. Body length 6.01–7.31 mm ($\bar{x}$=6.76 mm, SD=0.38, n=10), head width 1.79–2.26 mm (n=10), forewing length 1.46–1.81 mm ($\bar{x}$=1.65 mm, SD=0.09, n=20). Relative dimensions: HW 100, HL 85–87, UID 60–63, LID 47–49, AOD 15–16, IAD 14–16, OAD 23–24, IOD 20–21, OOD 16–17, CL 21–22, GW 18–20, EW 27–29; ML 39–40, SL 24–25, FL 158–162.

Structure. Head broad, inner orbits converging below, eyes almost bare, a few minute setae, clypeus with pale yellow marking on at least basal half; sculpture similar to female but with frons sculpture weaker than female, clypeus openly punctate. Antennae moderately long (FL 2.57 × UID), AS4:AS2+3=1. Remainder of body similar to female but pronotal lateral processes rounded to bluntly obtuse, weakly projected; mesoscutum anteriorly rounded; dorsal surface of propodeum not defined by carinae;

legs light red-brown except coxae and trochanters black to dark brown, tarsi almost pale yellow; some specimens with antennal flagellar segment 1 covered with short, red-brown setae; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Anterior one-third of clypeus and paraocular areas with short, adpressed, branched hair, frons with similar, erect hair, genae with moderate cover of branched hair, mesoventral area densely covered with branched hair; S2 and S3 with dense, posteriorly plumose hair, S4 with similar cover except rows with mesial gap, S5 and S6 with simple, adpressed hair.

Genitalia and associated sterna (figs 133E–H). Gonobase sides flanged basally, gonocoxite setose on inner margin, gonostyli setae long, branched, retrorse lobes well developed, setose, ventral flanges absent; S8 median process elongate, apically truncate, glabrous, S7 median process small, apically rounded, glabrous.

Distribution (fig. 133D). Eastern zone of the Eyrean province, except Tasmania.

Floral Forage Record. Families visited=6. Catch total=33; Anacardiaceae (1 catch), Fabaceae (2), Loranthaceae (1), Myoporaceae (2), Myrtaceae (21), Sapindaceae (6); Genera visited=9; *Acacia* (1), *Amyema* (1), *Angophora* (1), *Atalaya* (6), *Cassia* (1), *Eremophila* (2), *Eucalyptus* (18), *Melaleuca* (2), *Schinus* (1).

Flight Phenology.

2	0	0	2	0	0	0	0	4	14	11	10
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. There are several non-type specimens in various collections with the same locality data as the above holotypes. It appears that Froggatt collected a series of *L. pachycephalum* and dispatched them to various institutions. Unfortunately, Cockerell described these specimens as several different species. Indeed, he (1916c: 369) noted the close relationship between *L. pachycephalum* and *L. dolichocerus* but suggested separation was based on colour. Examination of the *L. pachycephalus* type (mandibular wear and presence of distal wing fraying, etc.) indicated that the specimen was either, freshly emerged when caught and had not developed the dark black pigmentation or, had been in alcohol for some time before pinning. The male type of *L. pachycephalus* shows weak macrocephaly. One specimen has a few mites on the posterior margin of the T1 and the propodeum.

Lasioglossum (Chilalictus) pappodum sp. nov.

Figures 24E, 24F, 134A–D

Material examined. Holotype. ♂, South Australia, 20 km S of Whyalla (33°12′S, 137°34′E), 3 Nov 1990, KLW, on *Eremophila* (NMV T-15792).

Paratypes (4♂♂). South Australia: 1♂, Lake Gilles Nat. Pk (32°56′S, 136°46′E), 3 Feb 1975, C.A. & TFH, on flowers of *Pittosporum phylliraeoides* (SAM); 3♂, same data as holotype. (NMV T-15793–15795).

Diagnosis. Unlike any other species. Male with body black, legs light red-brown, frons reticulate, antennae moderately long, mesoscutum shining, densely punctate, mesoventral area with two longitudinally raised ridges, ridges small and rounded, midline deeply grooved, dorsal surface of propodeum ruguloso-striolate, weakly defined by posterolateral carinae, fore, mid and hind tarsal segments, broad, laterally flanged, frons and paraocular areas with dense mat of hair, mesoscutum laterally with mat of short white adpressed plumose hair, mesoventral area with mat of imbricate short, stiff, serrate-edged bristles, sterna almost bare, forewings with 2nd r-m as strong as 1st r-m.

Description of male (female unknown). Body length 5.78–5.93 mm ($\bar{x}$=5.85 mm, SD=0.06, n=5), head width 1.74–1.83 mm (n=5), forewing length 1.62–1.67 mm ($\bar{x}$=1.64 mm, SD=0.02, n=5) coarsely reticulate. Relative dimensions: HW 100, sculpture HL 92–93, UID 62–65, LID 48–49, AOD 16–17, IAD 16–17, OAD 25–26, IOD 22–23, OOD 15–17, CL 22–23, GW 18–19, EW 28–29, SL 26–27, FL 128–132.

Structure. Head elongate, most of clypeus projected below lower levels of eyes, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape not reaching median ocellus. Clypeus convex, surface shining, openly to sparsely punctate with small, shallow punctures, supraclypeal area weakly projected, shining, sparsely punctate. Frons coarsely reticulate above antennal bases, sculpture extends laterally to inner margin of eyes, vertically to vertex. Antennae moderately long (FL 1.4 × UID), AS4:AS2+3=1. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum anterior margin rounded, weakly produced, mesial projection, punctation moderately coarse, surface shining, anteriorly impunctate, surface densely punctate, mesially with smooth interspaces, in parapsidal areas punctures contiguous, mesoventral area with two longitudi-

nally raised ridges, ridges small and rounded, midline deeply grooved (fig. 24E). Scutellum 1.3 × longer than dorsal surface of propodeum, surface projected, convex, shining, sparsely punctate except openly punctate along posterior margin. Dorsal surface of propodeum weakly defined by posterolateral carinae set well below dorsal level, posterovertical carinae almost reach dorsal carinae, dorsal sculpture rugulosostriolate, sculpture almost reaches rim, dorsal rim rounded, with dull sheen. T1 densely punctate. Mesepisternum and metepisternum weakly striate. BP rounded, not defined by carina, surface raised above surrounding basal part of leg; fore, mid and hind tarsal segments, broad, laterally flanged; forewings with 2nd r-m as strong as 1st r-m.

Colour. Body black, mandibles apically dark red-brown, basally pale yellow, basal half of clypeus pale yellow, antennae brown, femora, tibiae and tarsi bright light red-brown.

Vestiture. Body with cover of short hair, frons, paraocular areas, anterior margin of clypeus with dense mat of short, white, adpressed, plumose hair, mesoscutum with line of weak tomentum along posterior margin, mesoscutum laterally with mat of short, white, adpressed, plumose hair, mesoventral area with mat of imbricate short, stiff, serrate-edged bristles (fig. 24F), tomentum laterally on T2, across T3 and T4, sterna almost bare, S5 with short, adpressed hair posterolaterally directed, S6 with similar hair posteromesially directed and lateral tufts of long hair.

Genitalia and associated sterna (figs 134B–E). Gonobase large, sides flanged basally, gonocoxite with setose apical inner margin, gonostyli long, with branched setae on upper surface, retrorse lobes setose, well developed, ventral flanges absent; S8 median process elongate, apically rounded and glabrous, S7 median process apically rounded and glabrous.

Distribution (fig. 134A). Southern central South Australia.

Etymology. The epithet *pappodum* refers to the vestiture on the mesoventral area.

Floral Forage Record. Families visited = 2. Catch total = 2; Myoporaceae (1 catch), Pittosporaceae (1). Genera visited = 2; *Eremophila* (1), *Pittosporum* (1).

Flight Phenology.

0	1	0	0	0	0	0	0	0	0	1	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The diagnostic characters of this species are striking. In particular, the leg colour, flanged tarsal segments, mesoventral hair structure, vestiture, ridges and central groove and the lack of sternal pubescence warranted specific status. See *Remarks* on *L. albopilosum* for details of mesoventral hair structure.

Lasioglossum (Chilalictus) parasphecodum sp. nov.

Figures 15D, 135A–H

Material examined. Holotype, ♀, Western Australia, 8 km N of Ravensthorpe (33°31′S, 120°01′E), 2 Nov 1989, KLW, on *Melaleuca* (NMV T-15796).

Paratypes (20♀♀, 12♂♂). South Australia: 4♀♀, 4♂♂, 25 mi (40km) NE of Eucla, 9 Jan 1970, TFH, on *Eucalyptus oleosa* (SAM); 4♀♀, 6♂♂, 20 mi (32 km) NE of Eucla (31°36′S, 128°58′E), 9 Jan 1970, TFH, on *Eucalyptus oleosa* at sunrise (SAM); 1♀, Eyre Hwy, 3 km E of WA border (31°43′S, 129°03′E), 12 Nov 1987, TFH, on *Eucalyptus* (WAM 90/98); 1♀, 90 km W of Penong (31°56′S, 132°16′E), 27 Oct 1989, KLW, on *Eucalyptus* (NMV T-15797); 1♀, 32 km S of Kimba (33°20′S, 136°25′E), 10 Nov 1988, R.R. Snelling & J. Grey, on *Acacia* (LACM); 5♀♀, Port Lincoln (34°44′S, 135°52′E), Oct 1929, F.E. Wilson (NMV T-15798–15802); 1♀, 30 km E of Meningie (35°39′S, 139°44′E), 12 Nov 1990, L. Jansen, on *Calytrix tetragona* (NMV T-15803); 2♂♂, Meningie (35°41′S, 139°20′E) (ANIC).

Western Australia: 1♀, 5 km E of Eucla (31°43′S, 128°55′E), 28 Oct 1989, KLW, on *Eucalyptus* (NMV T-15804); 1♀, 18 km N of Norseman (32°09′S, 121°47′E), 20 Nov 1989, KLW, on *Melaleuca* (NMV T-15805); 1♀, 62 km E of Norseman (32°14′S, 122°18′E), 30 Oct 1989, KLW, on *Eucalyptus* (NMV T-15806); 1♀, same data as holotype (NMV T-15807).

Diagnosis. Unlike any other species. Both sexes with head and mesosoma black, metasoma red-brown. Female with frons finely reticulate/striate, pronotal dorsolateral angles not projected, mesoscutum produced with mesial projection, shining, mesially openly to closely punctate, dorsal surface of propodeum finely alveolate, not defined by carinae, metasomal tomentum absent. Male with antennae moderately long, AS4:AS2+3=1, legs light yellow-brown, genal hair forming a beard, fore coxae densely hirsute, sternal hair sparse, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.62–7.70 mm ($\bar{x}$ = 7.15 mm, SD = 0.31, n = 10), head width 2.07–2.19 mm (n = 10), forewing length 2.02–2.26 mm ($\bar{x}$ = 2.14 mm, SD = 0.08, n = 10). Relative dimensions: HW 100, HL 82–85, UID

55–56, LID 51–52, AOD 20–21, IAD 9–10, OAD 26–27, IOD 19–20, OOD 12–13, CL 21–23, GW 18–19, EW 25–26, SL 40–41, FL 75–77.

Structure. Head broad though distinctly triangular, inner orbits converging weakly below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of lateral ocelli. Clypeus short (CL 0.4 × LID), weakly convex, basal half with a dull sheen, ventromesially with large, deeply impressed, irregularly shaped punctures, ventrolaterally closely punctate with rounded punctures, anterior margin openly to closely punctate with slightly smaller, rounded punctures, supraclypeal area well projected, openly punctate with indistinct, small, shallow punctures. Frons (fig. 135A) finely reticulate above antennal bases, though with several weak striae near median carina, sculpture laterally weakens to almost smooth, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 135B) basal median area raised, forming tubercles, anterior margin forming raised rim, margin rounded mesially, distal process broad, not tapered, widest at base, median keel extends well beyond distal margin, lateral ridges coarsely serrate, distal margin deeply notched, without setae across, distal setae longer than penultimate setae, lateral teeth large, some distally hooked. Pronotum dorsolaterally rounded, not projected. Mesoscutum (fig. 135C) anterior margin with weakly bilobed mesial projection, punctation moderately coarse, anteriorly dull and impunctate, remainder shining, mesially openly to closely punctate, parapsidal areas and along posterior margin densely punctate. Scutellum 1.1 × longer than dorsal surface of propodeum, surface polished, almost impunctate except densely punctate along posterior margin. Dorsal surface of propodeum (fig. 15D) not defined by carinae, posterovertical carinae extend less than halfway to dorsal level, dorsal sculpture finely alveolate with a few weak striae laterally, sculpture extends to dorsal rim, rim rounded. T1 densely punctate except posterior marginal area openly punctate. Mesepisternum and upper portion of metepisternum finely striate, remainder smooth. BP rounded.

Colour. Head and mesosoma black, metasoma red-brown except mandibles red-brown apically (some specimens with clypeus tinged brown), underneath of flagellum light brown, legs dark brown, T4 and T5 suffused with dark brown to black.

Vestiture. Body sparse, frons with erect, minutely branched hair, paraocular areas with short, plumose hair and long minutely branched hair, clypeus with simple hair, mesoscutum with short, minutely branched hair, metasomal tomentum absent.

Description of male. Body length 6.16–7.08 mm ($\bar{x}$=6.57 mm, SD=0.28, n=10), head width 1.7–6-1.88 mm (n=10), forewing length 1.69–1.83 mm ($\bar{x}$=1.78 mm, SD=0.05, n=10). Relative dimensions: HW 100, HL 87–88, UID 60–61, LID 47–48, AOD 16–18, IAD 11–13, OAD 26–27, IOD 21–22, OOD 14–15, CL 22–23, GW 19–20, EW 28–29, ML 40–41, SL 31–33, FL 128–130.

Structure. Head triangular, inner orbits converging below, eyes with sparse cover of minute setae, scape just reaches median ocellus, clypeus convex, sculpture densely punctate with small, shallow rounded punctures, basal two thirds bright yellow, remainder brown, supraclypeal area well projected, surface dull. Antennae moderately long (FL 2.13 × UID), AS4:AS2+3=1. Remainder of body similar to female except mesoscutum parapsidal areas closely punctate, colour similar except clypeus as noted, mandible yellow, red-brown apically, T4 and T5 dark brown to black, legs light yellow-brown except fore coxae brown, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, lower paraocular areas with short, adpressed, plumose hair forming a mat, hair extends across upper portion of supraclypeal area, genae with long plumose hair forming a beard, fore coxae densely hirsute; sternal hair sparse, S2–S4 with short, branched, posteriorly directed hair across posterior margins, S5 with short, simple hair across entire surface.

Genitalia and associated sterna (figs 135E–H). Gonobase weakly flanged basally, gonocoxite weakly setose on inner apical margin, gonostyli setae long, densely branched on upper surface, retrorse lobes setose, well developed, ventral flanges absent; S8 median process elongate, apically rounded, with several branched setae, S7 median process apically rounded, branched setae apically and along lateral margins.

Distribution (fig. 135D). Southern Eyrean province following the floral distribution of the "mallee".

Etymology. The epithet *parasphecodum* refers to the colour markings which resemble those of *L. (Parasphecodes).*

Floral Forage Record. Families visited=2. Catch total=10; Fabaceae (1 catch), Myrtaceae

(9); Genera visited=4; *Acacia* (1), *Calytrix* (1), *Eucalyptus* (6), *Melaleuca* (2).

Flight Phenology.

2	0	0	0	0	0	0	0	0	4	5	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The body colour markings on this species are more common in *Lasioglossum (Parasphecodes).* Most specimens examined were originally placed in unsorted material of that subgenus.

Lasioglossum (Chilalictus) platycephalum (Rayment)

Figures 17D, 136A–H

Halictus platycephalus Rayment, 1927a: 101.
Halictus intermedia Rayment, 1927b: 109, syn. nov.
Halictus micridoneus Cockerell, 1930: 43–44, syn. nov.
Halictus mesembryanthemiellus Rayment, 1935: 699–700, syn. nov.
Lasioglossum (Chilalictus) platycephalum. — Michener, 1965: 177.
Lasioglossum (Chilalictus) intermedium. — Michener, 1965: 176.
Lasioglossum (Chilalictus) micridoneum. — Michener, 1965: 177.
Lasioglossum (Chilalictus) mesembryanthemiellum. — Michener, 1965: 177.

Material examined. Holotype of *platycephalus*, ♂, Victoria, Port Phillip, 22 Feb 1927 (ANIC, glued to a card, missing left fore femur and tibia, left mid tarsal segments, left forewing, metasoma detached from the body but remains on card.)

No type specimen, nor other specimens, are available for *intermedia*. The species is recognised by published figures of the characteristic fore basitarsal process (see *Remarks*).

Holotype of *micridoneus*, ♂, Queensland, Brisbane (27°28′S, 153°02′E), 19 Nov 1913, H. Hacker, Hy/4039 (QM).

Holotype of *mesembryanthemiellus*, ♀, Victoria, Sandringham (37°57′S, 145°00′E), Oct 1927 (NMV, missing right hind leg.)

Other specimens examined (46♀♀, 19♂♂). Queensland: Capalaba.

New South Wales and Australian Capital Territory: Nadgee Reserve, Tumbledown Mt, Moruya, Canberra, Brisbane Water NP.

Victoria: Gorae West, Melbourne, Drouin, Cobboboonee State Forest, Mordialloc, Emerald, Belgrave, Croydon, Mt Evelyn, Melbourne.

Tasmania: Launceston, Gladstone.

Western Australia: Porongurups, Salmon Gums, Merredin.

Diagnosis. Most like *L. spatulatum*. Both sexes black. Female with frons striate, mesoscutum dull, punctation moderately coarse, closely to densely punctate with weak striae along midline, dorsal surface of propodeum ruguloso-striolate, defined by weak posterolateral carinae set just below dorsal level, fore basitarsi with elongate narrow, apical process. Male with antennae short (FL 1.2 × UID), AS4:AS2+3=0.38, S3–S5 with plumose hair, mesial hair posterolaterally directed, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 5.24–6.47 mm ($\bar{x}$=5.80 mm, SD=0.33, n=10), head width 1.39–1.69 mm (n=10), forewing length 1.17–1.48 mm ($\bar{x}$=1.37 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 90–92, UID 64–66, LID 54–57, AOD 18–19, IAD 14–15, OAD 32–33, IOD 20–22, OOD 17–18, CL 22–23, GW 15–16, EW 28–29, SL 34–36, FL 58–60.

Structure. Head elongate, inner orbits converging weakly below, median frontal carina not reaching half way to median ocellus, eyes sparsely covered with minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.39 × LID), flat except convex along ventral margin, basally with a dull sheen, openly to closely punctate with small, rounded punctures, posteriorly dull, openly punctate, supraclypeal area weakly projected, confluent with contours of clypeus, surface dull, openly punctured. Frons (fig. 136A) striate above antennal bases, sculpture laterally striate until punctate along inner margins of orbits, extends vertically extends to anterior margin of lateral ocelli. Labrum (fig. 136B) basal median area raised, nodulated giving roughened surface, anterior margin rounded, distal process not widest at base, flanged distally, median keel extends to distal margin, lateral ridges reduced to single small projection, setae present across distal margin, lateral teeth small, not hooked. Pronotum dorsolaterally rounded, well projected. Mesoscutum (fig. 136C) anterior margin with rounded, mesial projection, punctation moderately coarse, surface dull, anteriorly impunctate, along midline densely punctate and weakly striate, mesially closely punctate, laterad of parapsidal lines and in parapsidal areas densely punctate. Scutellum 1.3 × longer than dorsal surface of propodeum, surface dull, openly punctate. Dorsal surface of propodeum (fig. 136C) defined by weak posterolateral carinae set just below dorsal level, posterovertical carinae extend to dorsal carinae, dorsal ruguloso-striolate, extends a few weak striae laterally, sculpture not reaching dorsal rim. T1 densely punctured. Mesepisternum and metepisternum

finely striate. Fore basitarsi apically with elongate narrow, apical process at least length of tarsal segments 2+3 (fig. 17D); BP rounded.

Colour. Head and mesosoma black, metasoma brown to red-brown above, light brown underneath, mandibles apically red-brown, antennal flagellum light brown underneath, legs brown.

Vestiture. Body sparse, frons short, erect, simple and minutely branched hair, paraocular areas and mesoscutum with longer, erect, branched hair, weak tomentum laterally on T2, across T3–T5.

Description of male. Body length 4.62–5.39 mm ($\bar{x}$ = 4.93 mm, SD = 0.26, n = 10), head width 1.36–1.76 mm (n = 10), forewing length 1.10–1.32 mm ($\bar{x}$ = 1.20 mm, SD = 0.07, n = 10). Relative dimensions: HW 100, HL 85–92, UID 64–66, LID 48–57, AOD 14–18, IAD 16–18, OAD 27–30, IOD 19–20, OOD 19–20, CL 20–21, GW 20–25, EW 25–30, ML 36–47, SL 22–30, FL 65–80.

Structure. Head elongate, inner orbits converging below eyes with sparse cover of minute setae, clypeus and supraclypeal area shining, clypeus weakly convex, openly to closely punctate with small, rounded punctures, basal area black to dark brown, without pale marking, sculpture similar to female though weaker, striae only above antennal bases. Antennae short (FL 1.2 × UID), AS4:AS2+3 = 0.38. Remainder of body similar to female except mesoscutum with dull sheen, openly to closely punctate mesially and in parapsidal areas, scutellum shining, openly to sparsely punctate, fore basitarsi without apical processes, forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, frons and paraocular areas with sparse cover of erect, branched hair, metasomal tomentum absent. S2 with long, plumose, posteriorly directed hairs across sternite, S3–S5 with plumose hair, hair shortest on S5, laterally hair posteriorly directed, mesial hair posterolaterally directed, S6 almost glabrous.

Genitalia and associated sterna (figs 136E–H). Gonobase sides weakly flanged basally, gonocoxite setose on apical inner margins and lateral and apicodorsal margins, gonostyli short, with sparse, short setae except several thickened, spine-like apical setae, retrorse lobes setose, well developed, ventral flanges present; S8 median process elongate, rounded, with several simple setae; S7 median process rounded, glabrous.

Distribution (fig. 136D). Bassian province, though mainly restricted to coastal areas.

Floral Forage Record. Families visited = 2. Catch total = 4; Goodeniaceae (3 catches), Myrtaceae (1); Genera visited = 2; *Goodenia* (3), *Kunzea* (1).

Flight Phenology.

10	6	1	1	0	1	0	2	0	4	5	9
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. The label data on the types of *Halictus mesembryanthemiellus* and *H. micridoneus* do not correspond to the published locality data. However, the specimens match the descriptions and carry the author's handwritten "type" identification label. The synonymy of *H. intermedia* is based on the "Figure 2" of Rayment's (1927b: 109) drawing which depicts the characteristic fore basitarsal process. The type of *H. platycephalus* is a macrocephalic male and several specimens with similar head enlargements were examined.

Lasioglossum (Chilalictus) plebeium (Cockerell)

Figures 24C, 25B, 137A–H

Halictus plebeius Cockerell, 1914a: 517

Lasioglossum (*Chilalictus*) *plebeium*. — Michener, 1965: 177.

Material examined. Holotype. ♀, South Australia, Purnong, near Murray River (34°51′S. 139°38′E), S.W. Fulton, Nat. Mus. Vict. 108, 157. BM Type Hym 17.a.962 (BMNH, metasoma and hind legs detached and glued to card.)

Other specimens examined (67♀♀, 16♂♂). Queensland: Stanthorpe, Quilpie, Mungallala, Morven, Windorah.

New South Wales: Batemans Bay, Clyde Mtn, Milton, Broken Hill, Cobar, Glen Innes.

South Australia: Coorong, Vivonne Bay, Gilberton, Adelaide, Orroroo.

Western Australia: Bullsbrook, Giles, Mitchell Plateau.

Diagnosis. Like *L. brunnesetum*. Female with head and mesosoma black, metasoma dark brown, frons striate, mesoscutum anterior margin with weak mesial projection, surface shining, along midline and in parapsidal areas densely punctate, mesially openly to closely punctate, mesoventral hair simple, dorsal surface of propodeum ruguloso-striolate on basal half only, weakly defined by posterolateral carinae. Male with antennae moderately short, mesoventral area with two small, widely separated, acutely pointed projections, S2 with long, curved, plumose hair, S3 and S4 with long, posteriorly directed, plumose hair, S5 with shorter, adpressed minutely plumose hair.

Description of female. Body length 4.93–6.16 mm ($\bar{x}$=5.52 mm, SD=0.44, n=10), head width 1.53–1.77 mm (n=10), forewing length 1.25–1.67 mm ($\bar{x}$=1.43 mm, SD=0.16, n=10). Relative dimensions: HW 100, HL 85–87, UID 60–61, LID 54–55, AOD 19–20, IAD 11–12, OAD 28–30, IOD 18–19, OOD 14–16, CL 20–21, GW 17–18, EW 24–25, SL 36–37, FL 68–71.

Structure. Head elongate, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaching at least anterior margin of median ocellus. Clypeus short (CL 0.38 × LID), convex, surface shining except anterior margin dull, ventrally openly to sparsely punctate with shallow, indistinct punctures, anteriorly closely punctate with distinct, rounded punctures, supraclypeal area almost flat, shining mesially, closely punctate. Frons (fig. 137A) striate/punctate above antennal bases, sculpture laterally weakens to almost smooth along inner margin of eyes, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 137B) basal median area raised, variously ridged anteriorly, anterior margin rounded mesially, lateral areas weakly recessed, distal margin not widest at base, weakly flanged distally, median keel extends to distal margin, lateral ridges small, weak, not extending near margin, setae present across margin, lateral teeth not distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 137C) anterior margin with rounded, weakly produced, mesial projection, punctation moderately coarse, surface shining except anteriorly dull with transverse lines, along midline and in parapsidal areas densely punctate, mesially openly to densely punctate. Scutellum 1.4 × longer than dorsal surface of propodeum, shining and sparsely punctate except along midline and around margin densely punctate. Dorsal surface of propodeum (fig. 137C) weakly defined by posterolateral carinae set just below dorsal level, posterovertical carinae extend less than half way to dorsal carinae, dorsal sculpture ruguloso-striolate on basal half only, remainder dull with minute alveolate pattern, dorsal rim rounded. T1 densely punctate except posterior marginal area impunctate, with fine transverse lines. Mesepisternum and metepisternum weakly striate. BP rounded.

Colour. Head and mesosoma black, metasoma dark brown, mandibles amber except red-brown apically, antennae brown above, light brown underneath, legs brown.

Vestiture. Body sparse, paraocular areas with long semi-adpressed, plumose hair, frons with short simple hair, mesoscutum with similar minutely branched hair, mesoventral hair simple, some tips of hairs globular (fig. 25B), tomentum laterally on T2, across T3 and T4.

Description of male. Body length 4.00–4.62 mm ($\bar{x}$=4.33 mm, SD=0.22, n=10), head width 1.39–1.55 mm (n=10), forewing length 1.08–1.20 mm ($\bar{x}$=1.15 mm, SD=0.04, n=10). Relative dimensions: HW 100, HL 89–90, UID 64–66, LID 49–51, AOD 15–16, IAD 14–15, OAD 29–30, IOD 21–22, OOD 17–18, CL 20–21, GW 19–20, EW 29–30, ML 39–40, SL 23–24, FL 110–112.

Structure. Head elongate, inner orbits converging below, eyes with a few minute setae, scape not reaching median ocellus, clypeus flat, shining, sparsely punctate, at least basal half pale yellow, supraclypeal area flat, shining, sparsely punctate. Antennae moderately short (FL 1.7 × UID), AS4:AS2+3=0.9. Remainder of body similar to female but with pronotal dorsolateral angles barely projected, anterior margin of mesoscutum rounded, surface with dull sheen, openly punctate mesially, dorsal surface of propodeum posterolateral carinae absent, dorsal sculpture almost striolate, mesoventral area with two small, widely separated, acutely pointed projections (fig. 24C) set at right angles to body, colour similar to female.

Vestiture. Body sparse, lower half of frons and paraocular areas with dense, short, adpressed, plumose hair forming a mat, ventral mesosternal area with dense, long, plumose hair, weak lateral tomentum of T2 and T3; S2 with long curved plumose hair, S3 and S4 with long posteriorly directed plumose hair, S5 with shorter, adpressed, minutely plumose hair.

Genitalia and associated sterna (figs 137E–H). Gonobase sides parallel, gonocoxite with setose apical inner margin, dorsal surface striate, gonostyli short, with long simple hair, retrorse lobes well developed, setose, ventral flanges absent; S8 median process elongated as spike-like projection, apically with a few setae, S7 median process apically rounded, with a few setae.

Distribution (fig. 137D). Mainly on the peripheral region of the Eyrean province, with localities ranging from coastal New South Wales to northern Western Australia.

Floral Forage Record. Families visited=7. Catch total=14; Aizoaceae (3 catches), Cruciferae (1), Fabaceae (2), Myoporaceae (1), Myrtaceae (5), Oxalidiaceae (1), Sapindaceae (1); Genera visited=9; *Atalaya* (1), *Carpobrotus* (2),

Eremophila (1), *Eucalyptus* (4), *Galenia* (1), *Leptospermum* (1), *Oxalis* (1), *Pultenaea* (2), *Rapistrum* (1).

Flight Phenology.

0	1	1	0	2	0	0	0	3	9	6	2
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Two male specimens show weak macrocephaly with the genae produced at a right angle posteriorly.

Lasioglossum (Chilalictus) pollux sp. nov.

Figures 138A–E

Material examined. Holotype, ♂, Western Australia, 70 mi (112 km) S Onslow (23°44′S, 115°07′E), 23 Aug 1971, TFH, on *Ptilotus* (SAM, head glued to pronotum.)

Paratypes. 1♀, 1♂, same data as female (SAM).

Other specimens examined (1♀). Western Australia: Pilbara.

Diagnosis. Most like *L. castor*. Both sexes black. Female with frons reticulate/striate, mesoscutum shining, densely punctate, dorsal surface of propodeum coarsely ruguloso-striolate, not defined by carinae, T1 with median lateral tomentose hair tufts, BP narrowed, acutely pointed. Male with antennae moderately long, AS4:AS2+3=0.9, head with dense cover of adpressed hair, S2–S4 with sparsely hirsute, S5 and S6 almost glabrous, pygidial plate bilobed, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.85mm, head width 2.04mm, forewing length 1.78mm. Relative dimensions: HW 100, HL 85, UID 61, LID 54, AOD 19, IAD 10, OAD 27, IOD 19, OOD 15, CL 20, GW 16, EW 23, SL 40, FL 66.

Other morphological characters of female as for *L. castor*.

Description of male. Body length 5.39–5.47 mm (n=2), head width 1.71–1.74 mm (n=2), forewing length 1.48–1.50 mm (n=2). Relative dimensions: HW 100, HL 88–89, UID 62–63, LID 50–51, AOD 16–17, IAD 13–14, OAD 26–27, IOD 20–21, OOD 16–17, CL 21–22, GW 17–18, EW 26–27, ML 37–39, SL 29–30, FL 118–120.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of minute setae, scape reaches just over halfway to median ocellus, clypeus flat, shining, weakly sculptured, basal half with pale white/yellow marking, supraclypeal area weakly projected, shining, median frontal carina extends less than halfway to median ocellus. Antennae moderately long (FL 1.90 × UID), AS4:AS2+3=0.9. Remainder similar to female, mesoscutum shining, densely punctate, interspaces distinctly present, dorsal surface of propodeum coarsely ruguloso-striolate, extends beyond rim laterally, to rim mesially, rim with dull sheen, pygidial plate rounded, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, frons, paraocular areas, supraclypeal area and anterior margin of clypeus densely covered with adpressed, plumose hair forming a mat, mesoscutum with long, erect and short, semi-adpressed, white, branched hair forming a moderate cover, T1 with conspicuous amounts of lateral hair, not forming lateral tomentum, T2 with lateral tomentum, across T3; sternal vestiture sparse, S2–S4 with sparse, erect, minutely branched hairs, not forming rows across sternites, S5 with a few short, setae, S6 glabrous and shining.

Genitalia and associated sterna (figs 138B–E). Gonobase sides parallel, gonocoxite setose on apical inner margin, gonostyli long, weakly swollen apically, with short, simple and weakly branched setae, retrorse lobes setose, well developed and elongated, ventral flanges present; S8 median process short, broadly truncate and weakly bilobed, with a few simple setae, S7 median process rounded apically, glabrous.

Distribution (fig. 138A). Northern Western Australian district of Onslow. A second female specimen (WA. Pilbara, 29 Oct 1935, Fuller (ANIC)) has tentatively been identified as conspecific.

Etymology. See *Remarks* for *L. castor*.

Floral Forage Record. Family visited=1. Catch total=1, Amaranthaceae (1 catch). Genus visited=1, *Ptilotus* (1).

Remarks. See *Remarks* for *L. castor*.

Lasioglossum (Chilalictus) polygoni (Cockerell)

Figures 13E, 139A–D

Halictus polygoni Cockerell, 1929c: 198.

Lasioglossum (*Chilalictus*) *polygoni*. — Michener, 1965: 177.

Material examined. Holotype, ♀, New Caledonia, Bourail, May 1927, W.P. Cockerell, at flowers of *Polygonum*, Type No. 57830 (USNM, head and forelegs glued to body, metasoma dislodged and glued to the pin.)

Other specimens examined (16♀♀). Queensland: Mt Beerwah, Noosa, Millaa Millaa, Danbulla, Cairns, Kuranda, Mt Lewis.

New South Wales: Lansdowne.

Diagnosis. Like *L. subplebeium*. Female with body black, frons weakly reticulate, clypeus, mesoscutum, scutellum, propodeum shining, dorsal rim recessed mesially; mesoscutum anterior margin with weakly bilobed mesial projection, punctation moderately coarse, dorsal surface of propodeum porcate, defined with weak posterolaterally carinae set well below dorsal level, posterovertical surface without plicae, dorsal rim smoothly rounded.

Description of female (male unknown). Body length 7.55–8.08 mm ($\bar{x}$=7.83 mm, SD=0.21, n=10), head width 2.21–2.23 mm (n=10), forewing length 1.97–2.23 mm ($\bar{x}$=2.08 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 83–85, UID 54–56, LID 53–54, AOD 20–21, IAD 9–11, OAD 24–26, IOD 15–16, OOD 14; CL 20–21, GW 18–20, EW 25–27, SL 42–43, FL 80–83.

Structure. Head broad, inner orbits slightly converging below (in some specimens almost parallel), median frontal carina well developed on lower half, remainder weakly developed, extends to median ocellus, in some specimens eyes with conspicuous cover of setae. Scape reaches at least anterior margin of lateral ocelli. Clypeus relatively short (CL 0.38 × LID), convex ventrally, surface shining except anteriorly dull, basal margin distinctly roughened with large, irregularly shaped, deeply impressed punctures separated by less than diameter of puncture, remainder closely punctate with rounded punctures, supraclypeal area protruded, shining mesially remainder dull, closely punctate with rounded, shallow punctures. Frons (fig. 139A) weak reticulate above antennal bases though reticulation aligned to appear somewhat striate, sculpture laterally almost smooth, extends vertically to anterior margin of lateral ocelli; vertex smooth. Labrum (fig. 139B) basal median area raised, coarsely roughened, distal process not tapered, widest at base, median keel barely reaching distal margin, lateral ridges serrate, extend to margin, setae not across distal margin, lateral teeth large, some hooked. Pronotum dorsolateral angles bluntly obtuse, well projected. Mesoscutum (fig. 139C) anterior margin with weakly bilobed mesial projection, anteriorly dull with fine transverse lineolation remainder shining, punctation moderately coarse, mesially openly to closely punctate, laterad of parapsidal lines closely punctate, in parapsidal areas closely to densely punctate. Scutellum slightly longer than dorsal surface of propodeum, shining, almost impunctate except around margin and along midline. Dorsal surface of propodeum (fig. 13E) defined with weak posterolaterally carinae set well below dorsal level, posterovertical surface without plicae, carinae extend at least halfway to dorsal carinae, dorsal surface shining, dorsal rim smoothly rounded, sculpture striate to porcate, almost reaches rim, rim recessed mesially, weakly raised to form lip, T1 densely punctured. Mesepisternum and upper half of metepisternum striate, remainder smooth. BP rounded.

Colour. Body black; mandibles dark red-brown apically, antennal flagellum and legs dark brown, some specimens with posterior anterior margin of tergites dark brown, hair on hind legs red-brown.

Vestiture. Body sparse, paraocular areas and mesoscutum with sparse, erect, branched hair, frons with shorter, minutely branched hair, metanotum with dense cover of short adpressed plumose hair forming a mat, weak lateral tomentum on T2–T4.

Distribution (fig. 139D). Coastal Queensland, with a single record from New South Wales (Lansdowne). This is the only species with a known extralimital distribution (New Caledonia).

Floral Forage Record. Families visited=2. Catch total=2; Ebenaceae (1 catch), Myrtaceae (1); Genera visited=2; *Diospyros* L. (1), *Eucalyptus* (1).

Flight Phenology.

0	0	0	0	2	2	0	2	0	2	2	2
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Comparison of the type specimen from New Calendonia with Australian specimens revealed that the type is slightly smaller and that the dorsal surface of the propodeum mesial sculpture is ruguloso-striolate. One specimen has two hypopial nymphal mites attached to the vertical surface of the propodeum and T2.

Lasioglossum (Chilalictus) ptyon sp. nov.

Figures 140A–D

Material examined. Holotype. ♀, Western Australia, Peak Charles (32°53′S, 121°10′E), 18–19 Oct 1985, TFH, 619, on flowers of *Carpobrotus* (WAM 87/635).

Paratype. ♀, Western Australia, near Emu Rock, 53 km E of Hyden (32°27′S, 119°25′E), 9–14 Oct 1979, TFH, 277-10, on flowers of *Carpobrotus* (WAM 87/99, gold coated.)

Diagnosis. Like *L. eremaean*. Female with head and mesosoma black, metasoma light brown; frons striate, mesoscutum openly to closely punctate, dorsal surface of propodeum ruguloso-striolate, not defined by carinae, T1 impunctate, fore tibial spur fan-shaped.

Description of female (male unknown). Body length 6.54–6.70 mm (n=2), head width 1.88–1.92 mm (n=2), forewing length 1.74–1.76 mm (n=2). Relative dimensions: HW 100, HL 89–90, UID 63–64, LID 58–59, AOD 20–21, IAD 10–11, OAD 28–29, IOD 19–20, OOD 15–16, CL 24–25, GW 17–18, EW 24–25, SL 39–40, FL 68–70.

Structure. Head broad, inner orbits barely converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.41 × LID), convex ventrally, surface shining, closely to densely punctate with broad, shallow indistinct punctures basally, anteriorly with small, rounded distinct punctures, supraclypeal area projected mesially, shining, openly to closely punctate. Frons (fig. 140A) finely striate above antennal bases, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 140B) basal median area raised, weakly nodulated, anterior margin rounded mesially, distal process not widest at base, weakly flanged distally, median keel dorsally thickened along length, extends to distal margin, lateral ridges almost absent, small, weak basal processes, not extending near margin, setae not present across distal margin, lateral teeth small, weakly hooked distally. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 140C) anterior margin rounded, punctation moderately fine, surface dull, covered with fine reticulate pattern, anteriorly impunctate, along midline and at posterior ends of parapsidal lines densely punctate, mesially and in parapsidal areas openly to closely punctate. Scutellum 1.5 × longer than dorsal surface of propodeum, surface shining, openly to closely punctate. Dorsal surface of propodeum (fig. 140C) not defined by carinae, posterovertical carina extend less than halfway to dorsal level, dorsal sculpture ruguloso-striolate mesially, a few striae laterally, sculpture not reaching rim, rim dull. T1 impunctate. Mesepisternum and metepisternum finely striate on upper half, remainder smooth. Fore tibial spur fan-shaped; BP rounded to bluntly obtuse.

Colour. Head and mesosoma black, metasoma light brown, antennal flagellum light brown underneath, legs dark brown,

Vestiture. Body sparse, frons and paraocular areas with some long, branched hair, clypeus with a few minutely branched hairs, mesoscutum appears glabrous, with sparse cover of short hair, metasomal tomentum laterally on T2, weakly across T3 and T4.

Distribution (fig. 140D). Southern Western Australia in the arid area bordering the Bassian region.

Etymology. The epithet *ptyon* means "fan" and refers to the shape of the fore tibial spur.

Floral Forage Record. Family visited=1. Catch total=2, Aizoaceae (2 catches). Genus visited=1, *Carpobrotus* (2).

Flight Phenology.

0	0	0	0	0	0	0	0	0	2	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Although few specimens of this species are known, the character states, in particular labrum, fore tibial spur shape and impunctate T1, warranted formal recognition.

Lasioglossum (Chilalictus) pulvitectum (Cockerell)

Figures 141A–H

Halictus pulvitectus Cockerell, 1915b: 98–99.
Lasioglossum (*Chilalictus*) *pulvitectum*. — Michener, 1965: 177.

Material examined. Holotype. ♀. Tasmania, Eaglehawk Neck (43°01′S, 147°55′E), 21 Feb–3 Mar 1913, R.E. Turner, BM Type Hym 17.a.922 (BMNH, right hind leg detached, glued to a card beneath specimen.)

Other specimens examined (12♀♀, 54♂♂). Queensland: Stanthorpe, Amiens.

New South Wales and Australian Capital Territory: Nadgee Reserve, Jindabyne, Moruya, Canberra.

Victoria: Frankston, Carrum, Melbourne, Weecurra, Grampians, Mitre, Kiata, Wilkur, Kerang.

Tasmania: Launceston, Devonport, George Town.

South Australia: Mt Gambier, West Beach, Kangaroo Is., Meningie, Adelaide, Athelstone, Birdwood, Morgan, Kimba, Poochera, Port Augusta, Haslam, Ceduna, Coward Springs.

Diagnosis. Most like *L. helichrysi*. Both sexes black. Female with frons reticulate/striolate, mesoscutum punctation conspicuously coarse, densely punctate, dorsal surface of propodeum ruguloso-striolate, not defined by carinae, T1 with anterolateral hair tufts, BP narrowed, acutely pointed. Male with antennae moderately

long, AS4:AS2+3=0.8, sternal vestiture sparse, pygidial plate rounded, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.31–7.32 mm ($\bar{x}$=6.86 mm, SD=0.32, n=10), head width 1.88–2.21 mm (n=10), forewing length 1.67–2.02 mm ($\bar{x}$=1.87 mm, SD=0.11, n=10). Relative dimensions: HW 100, HL 80–82, UID 61–62, LID 55–56, AOD 22–23, IAD 10–11, OAD 26–27, IOD 18–19, OOD 16–17, CL 20–21, GW 15–17, EW 23–24, SL 37–39, FL 65–67.

Structure. Head broad, distinctly triangular, inner orbits converging below, median frontal carina extends about halfway to median ocellus, eyes with sparse cover of minute setae. Scape reaches at least anterior margin of median ocellus. Clypeus short (CL 0.37 × LID), almost flat, lateral margins convex, surface shining, even sized punctures occur over surface, basally openly to closely punctate, anteriorly densely punctate, supraclypeal area weakly projected, shining, openly punctate. Frons (fig. 141A) reticulate above antennal bases though reticulation partially forming weak striations, sculpture laterally weakens to almost smooth along orbits, extends vertically to just beyond anterior margin of lateral ocelli. Labrum (fig. 141B) median basal area raised, surface smooth except a few weak nodules, anterior margin rounded mesially, distal process small, not widest at base, weakly flanged distally, median keel spatulate, projected well beyond distal margin, lateral keels absent, setae present across distal margin, lateral absent. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 141C) anterior margin rounded, punctation conspicuously coarse, surface shining except anteromesially dull and impunctate, remainder densely punctate, punctures almost contiguous over entire surface. Scutellum 1.4 × longer than dorsal surface of propodeum, surface shining, closely to densely punctate. Dorsal surface of propodeum (fig. 141C) not defined by carinae, posterovertical carinae extend less than halfway to dorsal level, dorsal sculpture ruguloso-striolate, extends at least to dorsal rim. T1 densely punctate. Mesepisternum and metepisternum weakly striate. BP narrowed, acutely pointed.

Colour. Body black except mandibles apically red-brown, flagellum brown underneath, metasomal posterior marginal areas on T1–T4 light brown, legs tinged with brown.

Vestiture. Body sparse, frons and paraocular areas with semi-erect, long, branched hair, paraocular hair denser, clypeus and supraclypeal area almost glabrous, with a few minutely branched hairs, mesoscutum with a sparse cover of short, erect, branched hair, mesoventral hair minutely branched; metanotum with dense short hair, T1 with anterolateral tufts of short, adpressed, posterolaterally directed, plumose hair forming a tomentum, other tomentum present laterally on T2, across T3 and T4.

Description of male. Body length 5.31–6.16 mm ($\bar{x}$=5.60 mm, SD=0.24, n=10), head width 1.67-1.90 mm (n=10), forewing length 1.34–1.67 mm ($\bar{x}$=1.54 mm, SD=0.10, n=10). Relative dimensions: HW 100, HL 87–88, UID 61–62, LID 48–49, AOD 16–17, IAD 13–14, OAD 26–27, IOD 19–20, OOD 15–16, CL 20–21, GW 16–17, EW 28–29, ML 35–37, SL 27–28, FL 125–128.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of minute setae, scape reaches just over halfway to median ocellus, clypeus flat, shining, weakly sculptured, basal half with pale white/yellow marking, supraclypeal area weakly projected, shining, median frontal carina extends less than halfway to median ocellus. Antennae moderately long (FL 2.1 × UID), AS4:AS2+3=0.8. Remainder similar to female but with mesoscutum shining, closely to densely punctate, dorsal surface of propodeum coarsely ruguloso-striolate, extends beyond rim laterally, to rim mesially, rim with dull sheen, colour similar to female except metasoma brown to light brown, in some specimens tibiae and tarsi light red-brown, pygidial plate rounded, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Body sparse, frons with adpressed, simple and erect, branched hair, paraocular areas with adpressed, plumose hair almost forming a mat, clypeus and supraclypeal area almost glabrous, metanotum without hair mat, T1 with minutely branched hair laterally, not forming tomentum, T2 with lateral tomentum, across T3; sternal vestiture sparse, S2–S4 with well separated, erect, minutely branched hairs, not forming rows across sternites, S5 with a few short, setae, S6 glabrous and shining.

Genitalia and associated sterna (figs 141E–H). Gonobase sides parallel, gonocoxite with several large, thickened setae on apical inner margin, gonostyli with simple and weakly branched hairs, retrorse lobes setose, well developed, elongate and extending beyond midline, ventral flanges absent; S8 median process apically rounded with simple setae, S7 median process apically rounded, glabrous.

Distribution (fig. 141D). Eastern zone of the Bassian province.

Floral Forage Record. Families visited=16. Catch total=25; Aizoaceae (4 catches), Anacardiaceae (1), Campanulaceae (1), Compositae (1), Convolvulaceae (1), Cruciferae (1), Dilleniaceae (1), Fabaceae (3), Goodeniaceae (1), Labiatae (1), Malvaceae (1), Meliaceae (1), Myrtaceae (5), Papaveraceae (1), Proteaceae (1), Zygophyllaceae (1); Genera visited=20; unidentified genus of Compositae (1), *Acacia* (1), *Cakile* (1), *Calytrix* (3), *Convolvulus* (1), *Daviesia* (1), *Dillwynia* (1), *Diplotaxis* (1), *Grevillea* (1), *Hibbertia* (1), *Kunzea* (1), *Lavatera* (1), *Leptospermum* (1), *Mesembryanthemum* (4), *Nitraria* (1), *Papaver* (1), *Scaevola* (1), *Schinus* (1), *Wahlenbergia* (1), *Westringia* (1).

Flight Phenology.

7	1	2	0	1	0	0	2	4	15	18	10
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. See *Remarks* for *L. castor.*

Lasioglossum (Chilalictus) quadratum sp. nov.

Figures 4E, 10C, 30A, 142A–H

Material examined. Holotype, ♀, Queensland, Morven (26°25′S, 147°07′E), 3 Nov 1971, EME, on *Eucalyptus* (QM T13911).

Paratypes (9♀♀, 7♂♂). Queensland: 1♀, 3♂♂, 26–40 mi (42–64 km) E of Charleville (26°24′S, 146°35′E), 31 Oct 1971, EME, on *Eucalyptus* (UQIC); 1♀, 4 km (6.4 km) W of Charleville, 1 Nov 1971, EME, on *Eucalyptus* (UQIC); 3♀♀, 2♂♂, same data as holotype (UQIC); 1♀, 2♂♂, Mungallala (26°27′S, 147°33′E), 3 Nov 1971, EME, on *Eucalyptus* (UQIC); 3♀♀, 3 mi (4.8 km) E of Mungallala (26°27′S, 147°33′E), 29 Sep 1967, TFH, on *Eremophila* (SAM).

Other specimens examined (24♀♀, 28♂♂) Queensland: St George, Drillham.

Victoria: Castlemaine, Euroa.

South Australia: Millicent, Kongal, Kangaroo Island, Sleaford Mere, Morgan, Nonning HS.

Diagnosis. Most like *L. smaragdinum.* Both sexes with square head. Female with head and mesoscutum metallic green, metasoma coppery, frons striate, mesoscutum length 0.9 × width, shining, mesially closely to densely punctate, laterad of parapsidal lines and in parapsidal areas densely punctate, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae set well below dorsal level, fore tibial spur fan-shaped. Male with head dark green, mesoscutum and metasoma metallic copper-green, antennae moderately long (FL 1.95 × UID), AS4:AS2+3=0.6, S2–S3 with plumose hair, S4 with similar hair laterally, mesially almost glabrous except mesially with small, median process covered with a hair tuft, forewings with 2nd r-m weaker than 1st r-m.

Description of female. Body length 3.85–4.62 mm ($\bar{x}$=4.24 mm, SD=0.25, n=10), head width 1.01–1.22 mm (n=10), forewing length 0.96–1.13 mm ($\bar{x}$=1.06 mm, SD=0.05, n=10). Relative dimensions: HW 100, HL 94–96, UID 62–64, LID 60–61, AOD 18–20, IAD 11–12, OAD 38–42, IOD 25–26, OOD 13–14, CL 20–21, GW 19–20, EW 28–30, SL 34–35, FL 82–84.

Structure. Head elongate (fig. 4F), almost as long as broad, appears square, inner orbits converging weakly below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape well short of median ocellus. Clypeus short (CL 0.34 × LID), weakly convex mesially and laterally, basal two-thirds smooth and shining, mesially with a few broad, shallow, punctures, laterally impunctate, anteriorly with a dull sheen, covered with fine reticulate pattern, sparsely punctate with small, rounded, shallow punctures, supraclypeal area weakly raised mesially, shining, sparsely to openly punctate with minute punctures. Frons (fig. 142A) coarsely striate above antennal bases, sculpture laterally weakens to punctate, extends vertically beyond lateral ocellus onto lateral margins of vertex. Labrum (fig. 142B) median basal area raised forming V-shaped tubercles, anterior margin rounded mesially, margin raised forming curved lip, distal process triangular, widest at base, median keel broad, extends to distal margin, lateral ridges large, dorsally smooth, basally recurved towards median keel, setae not present across distal margin, lateral teeth absent. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum (fig. 142C) narrow, length 0.9 × width, anterior margin rounded and projected over pronotum (fig. 10C), surface shining except anteriorly dull with fine reticulate pattern, punctation moderately coarse, mesially closely to densely punctate, laterad of parapsidal lines and in parapsidal areas densely punctate. Scutellum length equal to dorsal surface of propodeum, smooth, impunctate and highly polished except densely punctate along midline and around margins. Dorsal surface of propodeum (fig. 142C) defined by posterolateral carinae set well below dorsal level, carinae angular forming distinct lip, posterovertical carinae reach dorsal carinae, dorsal sculpture ruguloso-striolate, almost reaches dorsal rim mesially, rim smooth

with a dull sheen. T1 densely punctate except posterior marginal area impunctate. Mesepisternum and metepisternum smooth to minutely roughened, a few striae on upper portion, surfaces with a dull sheen. Fore tibial spur fan-shaped; BP broadly rounded.

Colour. Head dark green, mesoscutum metallic emerald green, metasoma coppery, clypeus black, mandibles amber, antennal flagellum brown underneath, mesoscutum tinged blue on anterolateral corners, legs with apical third to half of femora, tibiae and tarsi light red-brown, remainder dark brown.

Vestiture. Body sparse, frons almost glabrous, paraocular areas with a few, erect, minutely branched hairs, mesoscutum glabrous except a few short hairs around margins, metasomal tomentum absent.

Description of male. Body length 3.54–3.93 mm ($\bar{x}$=3.69 mm, SD=0.13, n=10), head width 1.03–1.11 mm (n=10), forewing length 0.92–0.96 mm ($\bar{x}$=0.94 mm, SD=0.01, n=10). Relative dimensions: HW 100, HL 92–93, UID 63–64, LID 56–57, AOD 15–16, IAD 15–16, OAD 38–39, IOD 26–27, OOD 15–16, CL 20–21, GW 26–28, EW 30–32, ML 52–57, SL 30–31, FL 122–125.

Structure. Head elongate, appears square, inner orbits converging weakly below, eyes with moderate cover of minute setae, scape not reaching median ocellus, clypeus weakly convex, surface highly polished, ventromesially weakly concave, basal half impunctate and yellow, anteriorly with a few minute punctures, and black, supraclypeal area weakly raised, smooth, impunctate and highly polished. Antennae moderately long (FL 1.95 × UID), AS4:AS2+3=0.6. Remainder similar to female, frons striate, median frontal carina reaches median ocellus, pronotum dorsolateral angles raised forming strong line of demarcation between dorsal and vertical surfaces, mesoscutum highly polished, openly to closely punctate mesially, densely punctate in parapsidal areas, scutellum conspicuously convex, smooth, highly polished, almost impunctate, dorsal surface of propodeum weakly defined by posterolateral carinae, dorsal sculpture ruguloso-striolate, dorsal rim polished; colour of head dark green, mesoscutum and metasoma metallic copper-green, legs with apical half to one third of femora, tibiae and tarsi light red-brown, remainder dark brown; S4 with median process; forewings with 2nd r-m weaker than 1st r-m.

Vestiture. Body sparse, lower paraocular areas with some short, semi-adpressed, minutely plumose hair, not forming a mat, frons with short, erect hair, mesoscutum with sparse cover of erect, branched hair, metasomal tomentum absent; S2 and S3 with cover of posteriorly directed, plumose hair extending across sternites, S3 with small median hair tuft, S4 with similar laterally, mesially almost glabrous except small, median process with covered with a hair tuft (fig. 30A).

Genitalia and associated sterna (figs 142E–H). Gonobase sides slightly flanged basally, gonocoxite without setae, gonostyli long, with dense apical cover of branched hair, retrorse lobes glabrous, well developed, ventral flanges present; S8 median process elongate, apically rounded and setose, S7 median process narrowed and elongate, glabrous.

Distribution (fig. 142D). Eastern zone of the Bassian province.

Etymology. The epithet *quadratum* refers to the square shape of the head in both sexes.

Floral Forage Record. Families visited=5. Catch total=21; Fabaceae (1 catch), Myoporaceae (1), Myrtaceae (17), Pittosporaceae (1), Proteaceae (1). Genera visited=7; *Acacia* (1), *Bursaria* (1), *Eremophila* (1), *Eucalyptus* (11), *Hakea* (1), *Leptospermum* (2), *Melaleuca* (4).

Flight Phenology.

2	3	0	1	0	0	0	0	1	3	12	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. See *Remarks* on *L. mesostenoideum*. Most male specimens show some form of macrocephaly. Intermediates are present between the extreme morphs except for a single, grossly enlarged male specimen with no intermediates. Conspecificity of this specimen was confirmed by examination of genitalia. The specimen showed allometric, rather than just macrocephalic, enlargement of the body, though it differs from the allometric "Type B" of *L. hemichalceum* in having fully formed and functional wings. The specimen was collected, by the author, at blossoms. The following measurements demonstrate its dissimilarity to other males of this species: body length 5.01mm, head width 1.72mm, forewing length 1.22mm. Relative dimensions: HW 100, HL 83, UID 77, LID 74, AOD 23, IAD 16, OAD 27, IOD 25, OOD 27, CL 18, GW 36, EW 22, ML 55, SL 32, FL 85. One female specimen carried a number of hypopial nymphal mite on the anterior half of T1.

Lasioglossum (Chilalictus) repraesentans (Smith)

Figures 13F, 143A–H

Halictus repraesentans Smith, 1853: 60.

Halictus seductus aptus Rayment, 1935: 706. syn. nov.

Halictus seductus gippsii Rayment, 1935: 707. syn. nov.

Lasioglossum (Chilalictus) repraesentans. — Michener, 1965: 177.

Lasioglossum (Chilalictus) aptum. — Michener, 1965: 175.

Lasioglossum (Chilalictus) gippsii. — Michener, 1965: 176.

Material examined. Holotype of *repraesentans.* ♀ New Holland, Van Diemens's Land. BM Type Hym. 17.a.895 (BMNH, missing antennae.)

Holotype of *aptus.* ♀, Vietoria, Hurst's Bridge (sic Hurstbridge) (37°38′S, 145°12′E). Jan 1930, Rayment. 72e (ANIC).

Holotype of *gippsii.* ♀, Vietoria, Leongatha (29°28′S, 152°48′E), 2 Jan 1929. Rayment (ANIC, head glued to pronotum, missing right hind leg.)

Other specimens examined (86♀♀, 12♂♂). New South Wales: Nadgee Reserve, Brindabella Ra., Blundells, Canberra, Mt Tomah, Narooma.

Vietoria: Wilsons Prom., Beech Forest, Lorne, Leongatha, Dromana, Yallourn, Emerald, Mt Searle, Belgrave, Monbulk, Melbourne, Croydon, Woori Yallock, Mt Evelyn, Warburton, Millgrove, Nowa Nowa, Greensborough, Broadmeadows, Hurstbridge, Buldah, Howqua, Grampians, Bendigo, Horsham.

Tasmania: Southport, Mt Arthur, Wedge Island, Kingston, Hobart, Collinsvale, Tyenna, Bothwell, Wayatinah, Derwent Bridge, Launceston, Nunamara, Henrietta, Gladstone.

South Australia: Belair, Birdwood, Athelstone.

Diagnosis. Most like *L. brazieri.* Both sexes with body black. Female with frons reticulate, clypeus with large irregularly shaped grooves, mesoscutum anteriorly bilobed, punctation moderately coarse, dorsal surface of propodeum ruguloso-striolate, not defined by carina, dorsal rim raised rim recessed mesially. Male with antennae moderately long, S2–S5 with long, branched hair across sterna with V-shaped vestiture on S4 and S5; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 7.85–9.32 mm ($\bar{x}$=8.70 mm, SD=0.49, n= 20), head width 2.30–2.47 mm (n=20), forewing length 2.23–2.51 mm ($\bar{x}$=2.44 mm, SD=0.08, n=20). Relative dimensions: HW 100, HL 77–82, UID 60–61, LID 54–55, AOD 21–22, IAD 9–10, OAD 24–26, IOD 15–16, OOD 16–17, CL 20–21, GW 17–20, EW 24–26, SL 42–43, FL 70–75.

Structure. Head wider than long, inner orbits converging below, median frontal carina reaches median ocellus, eyes with short sparse setae. Scape reaching beyond lateral ocelli. Clypeus short (CL 0.38 × LID), weakly convex, lustre dull, densely punctured with large irregularly shaped grooves, supraclypeal area bulbous, lustre dull, dense small punctures except mesially impunctate and shining. Frons (fig. 143A) reticulate above antennal bases, less so laterally, sculpture extends vertically to anterior margin of lateral ocelli. Labrum (fig. 143B) basal median area raised, sculpture smooth to weakly roughened, distal process widest at base, not tapered, median keel extending slightly beyond distal margin, lateral ridges weak, not reaching distal margin, setae extending across margin, lateral teeth large, some distally hooked. Pronotum dorsolateral angles obtuse, projected. Mesoscutum (fig. 143C) anterior margin bilobed, punctation moderately coarse, along midline close, laterad of midline area shining and sparsely punctured, parapsidal areas densely punctured. Scutellum 1.4 × longer than dorsal surface of propodeum, minutely punctured densely so around margin. Dorsal surface of propodeum (fig. 13F) not defined by carina, posterovertical surface with plicae present, carinae reaching less than half way to dorsal surface, dorsal rim raised rim recessed mesially, sculpture mesially ruguloso-striolate, laterally striolate, almost reaching rim mesially. T1 shining, densely punctured. Mesepisternum with strong striae, metepisternum with a few weak striae anteriorly; BP rounded.

Colour. Body black except mandibles dark red-brown apically, mesoscutum mesially with dark blue tinge, legs black to dark brown; forewings light brown.

Vestiture. Body sparse, face and mesoscutum with erect minutely branched hair; strong tomentum laterally on T2, across T3 and T4.

Description of male. Body length 6.54–7.24 mm ($\bar{x}$=6.85 mm, SD=0.36, n=4), head width 1.95–2.09 mm (n=4), forewing length 1.86–1.90 mm ($\bar{x}$=1.88 mm, SD=0.02, n=4). Relative dimensions: HW 100, HL 83–84, UID 61–62, LID 46–47, AOD 15–16, IAD 12–13, OAD 23–24, IOD 16–17, OOD 18–19, CL 21–22, GW 14–15, EW 30–31, ML 38–41, SL 30–31, FL 125–127.

Structure. Head broad, inner orbits converging below, eyes with sparse, minute setae; sculpture similar to female except- clypeus closely punctured with rounded punctures; basal

half to three-quarters of clypeus pale yellow. Antennae moderately long (FL 2.05 × UID), AS4:AS2+3=1. Remainder of body similar to female; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Head with erect plumose hair in paraocular areas and frons laterally, not forming dense cover, above antennal bases with short, erect, simple hair; S2–S5 with long, branched hair across sterna with weak V-shape on S4 and S5.

Genitalia and associated sterna (figs 143E–H). Gonobase sides flanged basally, gonocoxite setose on apical inner margin, gonostyli with long branched setae, retrorse lobes well developed, setose, ventral flanges present; S8 median process apically truncate, with long branched setae, S7 median process elongate, apically rounded with several short setae.

Distribution (fig. 143D). Eastern zone of the Bassian province.

Floral Forage Record. Families visited=6. Catch total=9; Compositae (2 catches), Fabaceae (1), Iridaceae (1), Myrtaceae (3), Proteaceae (1), Rhamnaceae (1); Genera visited=8; *Daviesia* (1), *Eucalyptus* (1), *Hakea* (1), *Kunzea* (1), *Leptospermum* (1), *Senecio* (2), *Spyridium* (1), *Watsonia* (1).

Flight Phenology.

24	4	0	1	0	2	0	0	3	4	4	14
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Lasioglossum (Chilalictus) roddi sp. nov.

Figures 8C, 144A–E

Material examined. Holotype. ♀, New South Wales, Willandra (33°12′S, 145°07′E), 17 Sep 1980, N.W. Rodd (AM, labrum removed, mounted on a minutin pin and gold coated).

Paratype. 1♂, same data as holotype (AM).

Other specimens examined (1♀, 2♂♂). South Australia: Marree.

Diagnosis. Most like *L. froggatti*. Both sexes with head and mesosoma black, metasoma dark brown. Female with frons striate, mesoscutum mesially openly to closely punctate, in parapsidal area densely punctate, dorsal surface of propodeum ruguloso-striolate, defined by posterolateral carinae set just below dorsal level, forewings with 1st m-cu entering base of third submarginal cell, mesoventral area hair minutely branched on anterior side of shaft only, hind trochanters and coxae with dense brushes of long, plumose hair, S2–S3 hair densely plumose. Male with antennae moderately short (FL 1.42 × UID), AS4:AS2+3=0.4, mesoventral area with two juxtaposed, apically rounded processes, S2–S4 with plumose hair across sternites, forewings with 2nd r-m weaker than 1st r-m, 1st m-cu enters base of third submarginal cell.

Description of female. Body length 5.24–5.26 mm (n=2), head width 1.29–1.30 mm (n=2), forewing length 1.65–1.66 mm (n=2). Relative dimensions: HW 100, HL 80–81, UID 62–63, LID 57–58, AOD 20–21, IAD 12–13, OAD 31, IOD 22–23, OOD 17–18, CL 19–20, GW 14–15, EW 27–28, SL 35–36, FL 63–65.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes with sparse cover of minute setae. Scape reaches anterior margin of median ocellus. Clypeus short (CL 0.35 × LID), convex ventrally, basal two-thirds shining, closely to densely punctate with large, deeply impressed punctures, anteriorly dull with fine transverse lineolation, openly punctate with small, shallow, rounded punctures. Frons striate above antennal bases coarsely striate, sculpture laterally weakens to punctate, extends vertically to anterior margin of lateral ocelli. Labrum (fig. 8C) median basal area raised, densely nodulated, anterior margin rounded mesially, distal process not widest at base, flanged distally, median keel reaches distal margin, lateral ridges weakly serrate, not reaching margin, setae not present across margin, distal setae originate submarginally, lateral teeth small, curved not distally hooked. Pronotum dorsolaterally rounded, moderately projected. Mesoscutum anterior margin rounded, anteriorly dull with fine lineolation, impunctate, remainder with a dull sheen, punctation moderately coarse, mesially openly to closely punctate, in parapsidal area densely punctate. Scutellum 1.3 × longer than dorsal surface of propodeum, surface smooth, highly polished, impunctate except for a few punctures along midline. Dorsal surface of propodeum defined by posterolateral carinae set just below dorsal level, posterovertical carinae extends greater than halfway to dorsal level, dorsal sculpture broadly ruguloso-striolate, almost appears striolate with several interconnectives, sculpture almost reaching dorsal rim mesially, dorsal rim smooth, highly polished. T1 openly to closely punctate. Mesepisternum finely striate on upper half, remainder smooth to minutely reticulate, metepisternum smooth except for a few striae on upper half.

Forewings with 1st m-cu entering base of third submarginal cell; BP broadly rounded.

Colour. Head and mesosoma black, metasoma dark brown with posterior marginal areas light brown, mandibles dark amber, red-brown apically, antennal flagellum brown underneath, legs brown.

Vestiture. Body with moderate cover, frons and paraocular areas with long, minutely branched hair, on frons hair erect, paraocular hair denser than on frons, hair semi-adpressed, almost forming a mat, antennal scapes with some long, basally plumose hair, mesoscutum with sparse cover of short, simple, adpressed hair, mesoventral area hair minutely branched on anterior side of shaft only, metasomal tomentum laterally on T2, across T3 and T4, hind trochanters and coxae with dense brushes of long, plumose hair, S2 and S3 hair densely plumose.

Description of male. Body length 4.24mm, head width 1.39mm, forewing length 1.08mm. Relative dimensions: HW 100, HL 80, UID 66, LID 62, AOD 17, IAD 14, OAD 30, IOD 24, OOD 19, CL 20, GW 16, EW 30, ML 38, SL 30, FL 94.

Structure. Head broad, inner orbits converging weakly below, eyes with sparse cover of minute setae, in side view ventral margin of clypeus at distinct angle to anterior margin, surface smooth and shining, indistinctly punctate with shallow punctures, basal half pale yellow/white. Antennae moderately short (FL 1.42 × UID), AS4:AS2+3=0.4. Remainder of body similar to female except frons finely striate, dorsolateral angles of pronotum not projected, mesoscutum shining, sparsely to openly punctate with minute, shallow punctures, scutellum impunctate, dorsally convex, dorsal surface of propodeum not defined by carinae, dorsal sculpture striolate with a few interconnectives mesially, almost reaches rim, rim smooth and shining, T1 openly punctate with posterior marginal area impunctate, mesoventral area with two juxtaposed, apically rounded, glabrous processes set at right angles to body, forewings with 2nd r-m weaker than 1st r-m, 1st m-cu enters base of third submarginal cell.

Vestiture. Frons, paraocular areas, clypeus and supraclypeal area densely covered with adpressed, plumose hair forming a mat, scape with long, plumose hair arising from base, hair as long as scape, mesepisternum with some long, plumose hair, mesoventral area with sparse, short, adpressed, minutely branched hair, metasomal tomentum laterally on T2 and T3; S2–S4 with posteriorly directed, plumose hair forming rows across posterior margin of sternites, S5 and S6 almost glabrous.

Genitalia and associated sterna (figs 144B–E). Gonobase sides slightly flanged basally, gonocoxite without setae, gonostyli long with long, simple hairs along upper margin only, retrorse lobes sparsely setose except for row of setae along distal margin, well developed, ventral flanges absent; S8 median process elongate, apically rounded and setose, S7 median process rounded, glabrous.

Distribution (fig. 144A). Single locality in central New South Wales.

Etymology. This species is named after Mr. Norman Rodd in recognition of his contribution to the understanding of native bees in Australia.

Floral Forage Record. Family visited=1. Catch total=1, Fabaceae (1 catch). Genus visited=1, *Acacia* (1).

Flight Phenology.

0	0	0	0	0	0	0	0	1	0	0	0
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Lasioglossum (Chilalictus) sculpturatum (Cockerell)

Figures 30B, 145A–H

Halictus sculpturatus Cockerell, 1930: 44–45.
Halictus omnivagus Rayment, 1935: 705, syn. nov.
Lasioglossum (*Chilalictus*) *sculpturatum*. — Michener, 1965: 177.
Lasioglossum (*Chilalictus*) *omnivagum*. — Michener, 1965: 177.

Material examined. Holotype of *sculpturatus*. ♂. Queensland, Stradbroke Island (27°50′S, 153°25′E), 17 Sep 1915, H. Hacker, HY/4037 (QM).

Syntypes of omnivagus. (3♀♀). Victoria: ♀, Kiata (36°22′S, 141°48′E), Oct 1928, F.E. Wilson; Grampians (37°00′S, 142°27′E), Oct 1928, F.E. Wilson; Carrum (38°05′S, 145°07′E), 29 Sep 1928, F.E. Wilson (ANIC).

Other specimens examined (132♀♀, 18♂♂). Queensland: Stradbroke Island, Fraser Island.

New South Wales and Australian Capital Territory: Lane Cove, Nadgee Reserve, Mt Kosciusko, Tahmoor, Sydney, Wentworth Falls, Mt Victoria, Bilpin, Blue Mountains.

Victoria: Tidal River, Seaford, Melbourne, Emerald, Grampians, Mitre, Kiata.

Tasmania: Queenstown.

South Australia: Victor Harbour, Kangaroo Island, Vivonne Bay, Magrath Flat, Kingscote, Meningie, Box Flat, Mt Lofty, Athelstone, Birdwood, Orroroo, Wilpena.

Western Australia: Torndirrup Nat Pk, Nornalup Nat Pk, Denmark, Denmark, Albany, Gin Gin, Pemberton, Margaret River, Jerramungup, Grass Patch, Dwellingup, Perth, Bullsbrook, Kellerberrin, Yanchep, Moora.

Diagnosis. Most like *L. clelandi*. Both sexes with body black (few specimens with metasoma amber). Female with frons reticulate/striate, mesoscutum punctation either openly punctate mesially with parapsidal areas closely to densely punctate, or closely punctate mesially, parapsidal areas densely punctate, dorsal surface of propodeum striate except small ruguloso-striolate mesial area, defined by weak lateral carinae, lateral areas weakly flanged, BP bluntly angular. Male with antennae moderately long, lower paraocular areas with dense mat of adpressed plumose hair, S4 with long plumose hair though weakly posterolaterally directed, S5 glabrous mesially, lateral hair posterolaterally directed, S6 glabrous except small lateral hair tufts, forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.54–8.24 mm ($\bar{x}$=7.64 mm, SD=0.46, n=10), head width 2.07–2.51 mm (n=10), forewing length 1.64–1.88 mm ($\bar{x}$=1.80 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 78–79, UID 56–57, LID 54–55, AOD 20–21, IAD 10–11, OAD 25–27, IOD 16–17, OOD 12–13, CL 20–21, GW 12–15, EW 22–24, SL 40–41, FL 63–65.

Structure. Head broad, inner orbits converging weakly below, median frontal carina not reaching median ocellus, eyes with sparse, but distinct, cover of minute setae. Scape reaching anterior margin of lateral ocelli. Clypeus and supraclypeal area not continuing contours of frons, clypeus short (CL 0.38 × LID), weakly convex, surface polished, punctation weak, with small, shallow punctures, openly punctate, supraclypeal area protruded, shining mesially, remainder dull, densely punctate around margin, openly punctate mesially. Frons (fig. 145A) reticulate above antennal bases, ridges partially aligned forming weak striate pattern, sculpture laterally reaches almost to inner margins of eyes, extends vertically to at least anterior margin of lateral ocelli. Labrum (fig. 145B) basal median area slightly raised, surface smooth, anterior margin obtuse mesially, lateral areas weakly recessed, distal process not tapered, not widest at base, slightly flanged distally, median keel spatulate, extends beyond distal margin, lateral ridges absent, setae extend across margin, lateral teeth small, distally hooked. Pronotum dorsolaterally rounded, weakly projected. Mesoscutum anterior margin rounded, punctation moderately coarse, surface shining, punctation either densely punctate along midline, openly punctate mesially with parapsidal areas closely to densely punctate (fig. 145C) or closely punctate mesially with parapsidal areas densely punctate. Scutellum 1.4 × longer than dorsal surface of propodeum, shining, densely punctate along midline and around margin, remainder openly punctate. Dorsal surface of propodeum (fig. 145C) defined by weak lateral carinae set just below dorsal level, posterolateral corners weakly flanged, posterovertical carinae extend about halfway to dorsal carinae, dorsal sculpture striate except ruguloso-striolate mesially on basal half only, sculpture reaches rim, dorsal rim dull, bluntly angular. T1 densely punctate. Mesepisternum striate, metepisternum smooth. BP bluntly obtuse.

Colour. Body black; mandibles red-brown apically, underside of antennae brown, legs brown, three specimens with metasoma light red-brown.

Vestiture. Body sparse, face with sparse, erect, branched hair, clypeus almost glabrous, mesoscutum with sparse, small erect hair, tomentum laterally on T2, across T3 and T4.

Description of male. Body length 6.16–7.24 mm ($\bar{x}$=6.66 mm, SD=0.39, n=10), head width 1.90–2.12 mm (n=10), forewing length 1.64–1.88 mm ($\bar{x}$=1.80 mm, SD=0.08, n=10). Relative dimensions: HW 100, HL 84–85, UID 60–61, LID 47–48, AOD 16–17, IAD 14–15, OAD 25–27, IOD 18–20, OOD 15–16, CL 18–21, GW 15–17, EW 28–30, ML 37–38, SL 28–30, FL 140–143.

Structure. Head broad, eyes converging below, with sparse cover of minute setae; clypeus flat, pale yellow on basal half, supraclypeal area weakly projected dull, frons striate. Antennae moderately long (FL 2.37 × UID), AS4:AS2+3=1. Remainder of body similar to female except pronotal dorsolateral angles almost absent, mesoscutum dull, except anteriorly surface densely punctate, scutellum densely punctate, dorsal propodeal carinae absent, sculpture similar, colour similar to female with legs dark brown to black, forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Lower paraocular areas with dense mat of adpressed, plumose hair, frons with long, branched and short, simple hair not forming a mat, tomentum laterally on T2–T4. S2 and S3 with long, plumose, posteriorly (S3 weakly

posterolaterally) directed hair across sternites, S4 with similar hair though weakly posterolaterally directed, S5 glabrous mesially, lateral hair posterolaterally directed, S6 glabrous except small lateral hair tufts (fig. 30B).

Genitalia and associated sterna (figs 145E–H). Gonobase sides parallel, continuing gonocoxal contours, gonocoxite setose on apical inner margin, gonostyli vestiture sparse except with several long hairs apically, retrorse lobes setose, well developed, ventral flanges absent; S8 median process elongate, apically rounded with a few setae, S7 median process rounded apically.

Distribution (fig. 145D). Bassian province.

Floral Forage Record. Families visited=7; Catch total=33; Compositae (1 catch), Dilleniaceae (1), Fabaceae (22), Myoporaceae (1), Myrtaceae (6), Orchidaceae (1), Sapindaceae (1); Genera visited=21; unidentified (1), *Aotus* (2), *Atalaya* (1), *Baeckea* (1), *Callistachys* Vent. (1), *Daviesia* (2), *Eucalyptus* (1), *Gastrolobium* R.Br. (1), *Hibbertia* (1), *Kunzea* (1), *Leptospermum* (1), *Melaleuca* (1), *Myoporum* (1), *Phyllota* (1), *Platylobium* (3), *Pultenaea* (7), *Senecio* (1), *Swainsona* (3), *Thelymitra* (1), *Verticordia* (1), *Viminaria* Sm. (1).

Flight Phenology.

3	1	0	1	0	0	0	5	17	25	16	8
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. Lasioglossum sculpturatum exhibits markedly different states of mesoscutal punctation (detailed above) within both eastern and western Australia populations. No sculpture or other character variation is present on the male.

Lasioglossum (Chilalictus) seductum (Cockerell)

Figures 14A, 146A–H

Halictus seductus Cockerell, 1914a: 512.

Halictus seductus nudus Rayment, 1935: 706–707. syn. nov.

Lasioglossum (*Chilalictus*) *seductum* — Michener, 1965: 177.

Lasioglossum (*Chilalictus*) *nudum* — Michener, 1965: 177.

Material examined. Holotype of *seductus*, ♀, Victoria, Windsor (37°52′S, 144°59′E), 1909, French (Froggatt Coll. 93), BM Type Hym. 17.a.972 (BMNH, missing right foreleg, mid tibia, mid tarsus, hind tarsus and left mid tarsus.)

Holotype of *seductus nudus*, ♀, Victoria, Sorrento (38°20′S, 144°45′E), 10 Dec 1929, Rayment (ANIC, missing right antenna and hind leg.)

Other specimens examined (71♀♀, 40♂♂). New South Wales and Australian Capital Territory: Mt Kosciusko, Wrights Lookout, Mt Gingera, Canberra, Barrington Tops, New England Nat. Pk.

Victoria: Sorrento, Gorae West, Melbourne, Emerald, Belgrave, Windsor, Heathmont, Hamilton, Halls Gap, Grampians, Kiata, Gunbower.

Tasmania: Mt Wellington, Plenty, Launceston, George Town, Bridport, Flinders Is.

South Australia: Kangaroo Island, Victor Harbour, Willunga, Monarto, Mt Lofty.

Diagnosis. Most like *L. brazieri*. Both sexes with body black. Female with frons coarsely reticulate, labrum lateral ridges absent; mesoscutum anterior margin with bilobed mesial projection, punctation conspicuously coarse, anterolaterally scabrous; dorsal surface of propodeum rugulose-striolate, defined by posterolateral carinae, posterovertical surface plicate, dorsal rim raised, recessed mesially. Male with paraocular areas with erect plumose hair almost forming dense matt, genae with long plumose hair, S2–S5 with long plumose semi-erect hair arising across plates; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 8.62–10.40 mm ($\bar{x}$=9.38 mm, SD=0.58, n=10), head width 2.51–2.66 mm (n=10), forewing length 2.40–2.87 mm ($\bar{x}$=2.66 mm, SD=0.12, n=10). Relative dimensions: HW 100, HL 82–83, UID 61–62, LID 54–56, AOD 21–22, IAD 10–12, OAD 24–25, IOD 16–18, OOD 17–18, CL 20–21, GW 22–23, EW 21–22, SL 42–43, FL 73–75.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes with minute sparse setae. Scape reaches anterior margin of lateral ocelli. Clypeus short (Cl 0.38 × LID) convex basally, shining, microtessellate and dull anteriorly, closely to densely punctate with large deeply impressed oval shaped punctures, supraclypeal area protruded, microtessellate and dull, indistinctly punctate. Frons (fig. 146A) coarsely reticulate above antennal bases, less so laterally, sculpture extends vertically to anterior margin of laterally ocelli. Labrum (fig. 146B) median area raised to distal margin, sculpture roughened with irregular longitudinal grooves, distal process not tapered, widest at base, median keel extends to margin, lateral ridges absent, distal margin with setae extending across margin, lateral teeth large, distally hooked. Pronotum dorsolateral angles sharply obtuse, projected. Mesoscutum (fig. 146C) anterior margin with bilobed mesial projection, punctation conspicuously coarse, anterolaterally scabrous, along midline closely

punctate with interspaces shining, reminder mesially and in parapsidal areas scabrous, irregularly shaped punctures with raised ridges forming margin of mesoscutal punctation surrounding puncture, interspaces absent, surface dull. Scutellum 1.3 × longer than dorsal surface of propodeum, weakly concave along midline, densely punctate along midline and margins, remainder sparsely punctate and shining. Dorsal surface of propodeum (fig. 14A) defined by angular posterolateral carinae set well below dorsal surface, posterovertical surface transversely plicate, carinae reaches dorsal carinae, dorsal rim raised, recessed mesially forming weakly concave V-shaped surface, sculpture ruguloso-striolate mesially, striate laterally, sculpture reaching rim. T1 densely punctate except posterior marginal area, sparsely punctate. Mesepisternum and metepisternum striate; BP rounded.

Colour. Body black; underneath of flagellum segments and legs brown, in some specimens apical margin and underturned portion of tergite brown.

Vestiture. Head and metasoma hirsute, face and metasoma with long, erect, branched hair, white tomentum laterally on T2, across T3 and T4.

Description of male. Body length 8.08–8.93 mm ($\bar{x}$=8.47 mm, SD=0.36, n=10), head width 2.18–2.46 mm (n=10), forewing length 2.28–2.56 mm ($\bar{x}$=2.42 mm, SD=0.09, n=10). Relative dimensions: HW 100, HL 85–87, UID 63–64, LID 47–48, AOD 16–18, IAD 13–14, OAD 23–24, IOD 16–17, OOD 17–18, CL 20–22, GW 13–14, EW 27–29, ML 38–40, SL 31–32, FL 130–133.

Structure. Head broad, inner orbits converging below, eyes with sparse minute setae; sculpture similar to female except scape reaching anterior margin of median ocellus, clypeus flat, densely punctate, basal three-quarters dull yellow, remainder black, supraclypeal area weakly produced. Antennae moderately long (FL 2.08 × UID), AS4:AS2+3=1. Remainder of body similar to female except T1 almost impunctate; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Similar to female, paraocular areas with erect, plumose hair almost forming dense mat, genae with long, plumose hair, mesoventral area with short, plumose, posteriorly directed hair forming dense mat. S2–S5 with long, plumose, semi-erect hair arising across plates, S6 with short, adpressed hair mesially, laterally forming weak tufts.

Genitalia and associated sterna (figs 146E–H). Gonobase sides narrowed basally, gonocoxite setose on inner apical margin, gonostyli setae with long simple and branched hair, retrorse lobes well developed, setose, ventral flanges present; S7 and S8 median processes apically rounded and setose.

Distribution (fig. 146D). Eastern zone of the Bassian province.

Floral Forage Record. Families visited=6. Catch total=7; Compositae (1 catch), Dilleniaceae (1), Fabaceae (2), Proteaceae (1), Rutaceae (1), Xanthorrhoeaceae (1); Genera visited=7; *Acacia* (1), *Boronia* (1), *Conospermum* (1), *Hibbertia* (1), *Hypochoeris* (1), *Pultenaea* (1), *Xanthorrhoea* (1).

Flight Phenology.

3	0	2	0	0	0	0	3	13	13	11	5
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Lasioglossum (Chilalictus) seminitens (Cockerell)

Figures 147A–H

Halictus seminitens Cockerell, 1929b: 230.
Lasioglossum (*Chilalictus*) *seminitens*. — Michener, 1965: 177.

Material examined. Holotype. ♀, Western Australia, Wyalcatchem (sic. Wyalkatchem) (31°11′S, 117°23′E), 30 Aug 1926, Nicholson (AM).

Other specimens examined (41♀♀, 5♂♂). Western Australia: Walpole, Manjimup, Pemberton, Lake Grace, Kulin, Dwellingup, Narrogin, Dryandra, Beverley, Darlington, York, Cunderdin, Merredin, Kellerberrin, Wyalkatchem, Minnivale, Badgingarra, Eneabba, Arrowsmith River, Mingenew, Mt Horner, Dongara.

Diagnosis. Most like *L. striatum*. Both sexes black. Female with frons coarsely reticulate, mesoscutum punctation moderately coarse, mesial area with dull sheen, openly to closely punctate, parapsidal areas densely punctate and striate, dorsal surface of propodeum ruguloso-striolate, lateral margins of dorsal surface striate. Male with antennae moderately long, S2–S5 with branched hair extending across sternites, length and amount of branching decrease from S2–S5; forewings with 2nd r-m as strong as 1st r-m.

Description of female. Body length 6.85–8.24 mm ($\bar{x}$=7.91 mm. SD=0.43, n=10), head width 1.90–2.31 mm (n=10), forewing length 1.83–2.35 mm ($\bar{x}$=2.20 mm, SD=0.15, n=10).

Relative dimensions: HW 100, HL 80–82, UID 62–64, LID 55–56, AOD 21–22, IAD 9–10, OAD 23–24, IOD 15–16, OOD 18–19, CL 20–22, GW 16–17, EW 22–23, SL 40–41, FL 70–74.

Structure. Head broad, inner orbits converging below, median frontal carina reaches median ocellus, eyes sparsely covered with minute setae. Scape reaches posterior margin of lateral ocelli. Clypeus short (CL 0.39 × LID), convex, more so anteriorly, basal half shining with large, deeply impressed, irregularly shaped puncture, posteriorly dull, openly to closely punctate with small, rounded punctures, supraclypeal area well projected, dull, openly punctate. Frons (fig. 147A) coarsely reticulate above antennal bases, less so laterally, sculpture extends vertically to posterior margin of lateral ocelli. Labrum (fig. 147B) basal median area raised, variously ridged and nodulated, distal process not tapered, widest at base, median keel extends to distal margin, lateral ridges absent, setae not present across margin, lateral teeth short and stout, not distally hooked. Pronotum dorsolateral angles obtuse, well projected. Mesoscutum (fig. 147C) anterior margin with weak, rounded mesial projection, punctation moderately coarse, surface dull except mesial area to posterior margin with a dull sheen, openly to closely punctate, laterad of parapsidal lines and in parapsidal areas densely punctate, semi-circular striae extend from anterolateral areas through parapsidal areas to posterior margin. Scutellum length equal to dorsal surface of propodeum, surface with a dull sheen, closely to densely punctate. Dorsal surface of propodeum (fig. 147C) not defined by carinae, posterovertical carinae extend less than halfway to dorsal level, dorsal sculpture ruguloso-striolate mesially, striolate laterally, sculpture reaching rim, lateral margins of dorsal surface striate. T1 densely punctured. Mesepisternum and upper half of metepisternum striate, remainder smooth. BP rounded.

Colour. Body black; mandibles apically dark red-brown, flagellum underneath, legs and posterior marginal area of tergites dark brown.

Vestiture. Body sparse, paraocular areas with long, branched hair, frons, clypeus and mesoscutum with shorter, minutely branched hair, tomentum laterally on T2, across T3 and T4.

Description of male. Body length 5.47–7.01 mm ($\bar{x}$=6.21 mm, SD=0.55, n=5), head width 1.76–1.97 mm (n=5), forewing length 1.55–1.74 mm ($\bar{x}$=1.62 mm, SD=0.07, n=5). Relative dimensions: HW 100, HL 87–88, UID 64–65, LID 46–47, AOD 15–16, IAD 16–17, OAD 25–26, IOD 17–20, OOD 17–18, CL 23–24, GW 15–16, EW 32–33, ML 40–41, SL 31–32, FL 139–145.

Structure. Head broad, inner orbits converging below, eyes with sparse cover of minute setae, sculpture similar to female except clypeus almost flat, at least basal half pale white, entire surface with dull sheen and roughened with elliptical punctures, supraclypeal area shining mesially, median carina forming projected keel on upper half. Antennae moderately long (FL 2.23 × UID), AS4:AS2+3=1. Remainder of body similar to female except, pronotal dorsolateral process rounded, weakly projecting, mesoscutum mesially shining, openly to closely punctate, parapsidal areas densely punctate, weakly striate, scutellum closely punctate, apart from clypeus noted above colour similar to female except metasoma tinged brown; forewings with 2nd r-m as strong as 1st r-m.

Vestiture. Paraocular areas with long, branched hair almost forming a mat, frons and clypeus with a few minutely branched hairs, mesoventral area with dense cover of short, adpressed, simple and minutely branched hair, lateral tomentum present on T2 and T3; S2–S5 with branched hair extending across sternites, S2 hair semi-erect, S5 hair adpressed, length and amount of branching decrease from S2–S5.

Genitalia and associated sterna (figs 147E–H). Gonobase sides slightly narrowed basally, gonocoxite setose on apical inner margin with long, simple setae as well dorsally along lateral margin, dorsal surface finely striate, gonostyli with long, simple and weakly branched setae, retrorse lobes, setose, well developed, ventral flanges present, lobes setose; S8 median process elongate, rounded, with setae, S7 median process elongate, rounded, with setae.

Distribution (fig. 147D). Western zone of the Bassian province.

Floral Forage Record. Families visited=2. Catch total=4; Fabaceae (1 catch), Proteaceae (3); Genera visited=4; *Dryandra* (1), *Gastrolobium* (1), *Grevillea* (1), *Isopogon* (1).

Flight Phenology.

0	0	0	0	0	0	0	2	8	9	0	1
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Remarks. An interesting species, particularly the unusual striate sculpture on mesoscutum of the female. The known floral foraging records suggest that the species does not visit Myrtaceae.